Final Environmental Impact Report/
Final Environmental Impact Statement

Volume I

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BART–SAN FRANCISCO AIRPORT EXTENSION

Bay Area Rapid Transit District

U.S. Department of Transportation
Federal Transit Administration

samTrans
San Mateo County Transit District

FINAL
ENVIRONMENTAL IMPACT STATEMENT

FINAL
ENVIRONMENTAL IMPACT REPORT

BART–SAN FRANCISCO INTERNATIONAL AIRPORT EXTENSION

NORTHERN SAN MATEO COUNTY
CALIFORNIA

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL TRANSIT ADMINISTRATION (FTA)

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT (BART)
SAN MATEO COUNTY TRANSIT DISTRICT (SAMTRANS)

WITH COOPERATING AGENCIES:
U.S. ARMY CORPS OF ENGINEERS
FEDERAL HIGHWAY ADMINISTRATION
FEDERAL AVIATION ADMINISTRATION

PURSUANT TO:

National Environmental Policy Act of 1969, §102, 42 U.S.C. §4332(2)(c); National Historic Preservation Act of 1966, §106, 16 U.S.C. §470f; Federal Transit Act, as amended, §§(d), 3(i) & 14, 49 U.S.C. §§1602(d) and (i) and 1610; Title 49 U.S.C. §303 formerly Department of Transportation Act of 1966, §4(f); and California Environmental Quality Act, California Public Resource Code §21000 *et seq.*

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Abstract

This document describes and summarizes the transportation impacts, environmental impacts, and costs for the Locally Preferred Alternative, selected by BART and SamTrans, to improve mass transit in the northern San Mateo County corridor. Specifically, this FEIR/FEIS details the preferred horizontal and vertical alignment, station locations, their capital and operating costs, and considers their potential effects on transportation service, traffic, transit ridership, accessibility, land use, neighborhoods, economic factors, natural resources, air quality, noise and vibration, parklands, historic sites, and financial feasibility. BART intends to seek a federal transit grant to assist in the funding of the selected project.

Alternatives considered prior to selecting the Locally Preferred Alternative included the No Build, Transportation Systems Management (TSM), and five BART improvement alternatives, along with various design options. The information resulting from the environmental studies as well as public and agency comments were considered by BART and SamTrans in selecting the Locally Preferred Alternative.

Comments

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LIST OF KEY ACRONYMS

AA/DEIS/DEIR	Alternatives Analysis/Draft EIS/Draft EIR
ABAG	Association of Bay Area Governments
ALRS	Airport Light Rail System
BART	Bay Area Rapid Transit District
CalTrain	Peninsula Commute Service
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
DEIR/SDEIS	Draft EIR/Supplemental Draft EIS
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FEIR/FEIS	Final EIR/Final EIS
FTA	Federal Transit Administration (formerly UMTA)
FRDEIR/S#2DEIS	Focused Recirculated Draft EIR/Supplemental #2 Draft EIS
GTC	Ground Transportation Center
LPA	Locally Preferred Alternative
MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Railway
NEPA	National Environmental Policy Act
SamTrans	San Mateo County Transit District
SFIA	San Francisco International Airport
SPTCo	Southern Pacific Transportation Company
TSM	Transportation Systems Management
UMTA	Urban Mass Transportation Administration (now FTA)

Additional acronyms and definitions are provided in the Glossary located in Appendix A.

Chapter 1
Introduction

This introductory chapter provides an overview to the proposed extension of BART (Bay Area Rapid Transit) service to the San Francisco International Airport (SFIA). This overview consists of three parts:

- a brief history of the planning, engineering, and environmental studies that have been performed for this project;
- the purpose and need for this project and the specific transportation, land use, and environmental goals it seeks to attain; and
- an introduction to the organization and contents of the final environmental documents and specifically to this Volume I.

1.1 BART–San Francisco Airport Extension Overview

Historical Background

Since the early 1970s, over 90 transportation improvement options within the San Francisco-to-San Jose corridor have been studied. The first major study that evaluated BART alternatives, the San Francisco Airport Access Study, was completed in 1972. In 1984 and 1985, the Metropolitan Transportation Commission (MTC), the regional transportation planning agency, undertook a Peninsula Mass Transit Study, which followed Federal Transit Administration (FTA), U.S. Department of Transportation guidelines for developing, screening, and refining transit alternatives. This study recommended a long-term strategy to improve rail service on the San Francisco Peninsula. This recommendation was further refined in the Preliminary Alternatives Analysis, which reviewed BART service, CalTrain upgrades, high-occupancy vehicle lanes, and light rail transit. The Preliminary Alternatives Analysis concluded that BART was the most cost-effective mode and that the Colma-to-SFIA corridor, using the Southern Pacific Transportation Company (SPTCo) San Bruno branch railroad right-of-way, was the preferred corridor for further study.

Between 1990 and 1996, the BART District, San Mateo County Transit District (SamTrans), and FTA continued their examination of various transportation alternatives within the preferred corridor. Different routes, station locations, and vertical alignments (i.e., below ground, at grade, or aerial configurations), have been analyzed. The culmination of these studies was selection of a "Locally Preferred Alternative" (LPA) that extends through Colma, South San Francisco, San Bruno, the SFIA, Millbrae, and Burlingame. The LPA selected by the BART and SamTrans boards on November 28 and 29, 1995 is the Aerial Design Option of Alternative VI (referred to in this document as the Aerial Design Option LPA). An in-depth description of the LPA selection process is presented in Section 2.2 of this report. Details regarding the Aerial Design Option LPA alignment and station facilities are provided in Section 2.3 of this document.

Environmental Documentation

Because implementation of a BART extension requires approval from both state and federal entities, compliance with California Environmental Quality Act (CEQA) and National Environmental Policy Act

(NEPA) legislation is necessary. Both state and federal laws require that a document be prepared to inform the public of environmental consequences of the project alternatives and possible mitigation measures to reduce the significance of identified impacts. Both CEQA and NEPA regulations encourage the preparation of a single document to satisfy both state and federal laws. Accordingly, BART and SamTrans—the project sponsors and the co-lead agencies under CEQA—in coordination with FTA—the lead agency under NEPA—combined the state and federal processes to produce an Environmental Impact Report/Environmental Impact Statement (EIR/EIS).

Draft environmental documents were prepared in 1995: the *Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement* (DEIR/SDEIS) of January 1995 and the *Focused Recirculated Draft Environmental Impact Report/Supplemental #2 Draft Environmental Impact Statement* (FRDEIR/S#2DEIS) of September 1995. The public was provided with an opportunity to comment on these draft reports and to express their opinions on the merits of the alternatives considered. This FEIR/FEIS documents the final environmental analysis of the Aerial Design Option LPA, responds to comments from the public on the draft environmental documents, describes the current engineering and architectural drawings for the project, and presents the findings of federal agencies, as required by NEPA.

1.2 Purpose and Need for the Project

The BART–San Francisco Airport Extension is being advanced to alleviate regional highway congestion and improve air quality, as well as in response to a public mandate for the project. The primary reasons for the project are described below.

Highway Congestion

Existing Congestion. Regional freeways in the study area include Highway 101 and Interstate 280 (I-280), each running north-south along the Peninsula, and I-380, connecting Highway 101 and I-280 through San Bruno. The California Department of Transportation reports that traffic on these freeways near the SFIA and into San Francisco regularly exceeds existing capacities, resulting in significant periods of stop-and-go movement and severe reductions in levels of service. Major contributors to the congestion include travel by Peninsula workers to and from San Francisco employment centers, and travel by airport passengers, visitors, and employees to and from the SFIA.

Future Travel Demand. Growth in population and employment throughout the San Francisco Bay Area will spur increased demand for mobility. The Association of Bay Area Governments (ABAG), in its *Projections '94,* forecasts that San Mateo County population will increase 15 percent and employment 23 percent between 1990 and 2010. MTC, which uses these projections to make regional travel forecast, predicts that traffic flow from San Mateo and Santa Clara counties to downtown San Francisco will increase 16 percent between 1987 and 2010, and traffic to and from the SFIA will increase 52 percent during the same period. The most significant travel demand will be work trips between San Mateo and San Francisco counties. The number of daily work trips is projected to be 201,500 by 2010, making the Peninsula second only to the Bay Bridge corridor in the region's transit markets. Regional freeways are congested during peak commute hours in 1996, and this additional travel demand will result in longer periods of stop-and-go conditions.

The only existing transit systems along the Peninsula that offer alternatives to the automobile are SamTrans buses and the Peninsula Commute Service (CalTrain), a commuter rail operation. Buses run

on the same congested roadways as automobiles and, thus, for commute distances, do not offer substantial advantages over cars. By contrast, rail service, such as that provided by BART and CalTrain, operates in its own right-of-way. Both BART and CalTrain services are needed to ease the projected increase in traffic volumes along Highway 101. Although CalTrain does not currently serve the SFIA, construction of a BART intermodal station would provide a connection between CalTrain and the new Airport International Terminal. This intermodal connection would enhance CalTrain's attractiveness for travelers to the SFIA, further reducing SFIA-related congestion along Highway 101 in northern San Mateo County.

Future Travel Demand at the SFIA. The SFIA is the single largest traffic generator in the study area. The 1989 *San Francisco International Airport Final Draft Master Plan* (referred to in this document as the SFIA Master Plan) projects that the number of annual air passengers will increase from approximately 30 million in 1990 to over 51 million in 2006. More than 65 percent of airport passengers and employees drive to the SFIA, and without better connections to the region's major rail systems, the automobile will continue as the dominant mode of access. Yet, opportunities to improve the Highway 101/SFIA connection are restricted; the system of on- and off-ramps into the terminals is complex, and further modifications to these ramps have been proposed to provide access to the new SFIA projects. Furthermore, improvements to the interchanges north and south of the SFIA would be difficult, because of uncertain funding sources, the number of approvals required from multiple jurisdictions, and environmental issues.

The SFIA Master Plan outlines infrastructure improvements to be implemented by the year 2006 to accommodate projected growth at the airport. Key improvements that could interface with BART service at SFIA include the construction of an International Terminal, a Ground Transportation Center/Rental Car Garage, an Airport Light Rail System, and new highway ramps into and out of the airport. These projects are independent of the proposed BART–San Francisco Airport Extension and will be implemented whether or not the extension is constructed. Likewise, the proposed BART project, if adopted, would be built even if SFIA Master Plan projects are not pursued.

Opportunities for Highway Expansion. In spite of the projected demands for travel along the Peninsula, opportunities to increase capacity along the freeways by widening them are limited by right-of-way acquisition requirements, environmental impacts, and community opposition. While BART/SamTrans likewise face obstacles, the proposed BART–San Francisco Airport Extension would minimize land acquisition and displacement by utilizing an existing rail right-of-way. Existing and projected travel conditions on the Peninsula, along with constraints to expanding highway capacity, highlight the need for improved mass transit systems to assume a larger role in addressing regional concerns. The BART project offers a viable way of meeting these regional transportation requirements.

Air Quality

Air quality in the San Francisco Bay Area does not currently meet certain federal and state ambient air quality standards; the Bay Area is designated as a "nonattainment" area for the state ozone and particulate matter standards, and the federal carbon monoxide standard. The Bay Area Air Quality Management District, with the cooperation of MTC and ABAG, has prepared plans to achieve and maintain federal and state ambient air quality standards. A key transportation-related measure of these plans is the expansion of regional rail transit, with extension of BART to the SFIA specifically identified as part of that expansion. The BART–San Francisco Airport Extension, combined with other regional rail projects, is projected to reduce reactive hydrocarbons by 1.2 tons per day, nitrogen oxides by 1.7 tons per day, and

carbon monoxide by 17.0 tons per day. Thus, the BART extension is an important element in the continued improvement of air quality in the Bay Area.

Public Mandate

The BART–San Francisco Airport Extension has long received public support. In November 1985, San Mateo County voters passed Measure A, which authorized SamTrans to allocate funds for the BART Colma extension. In November 1987, San Mateo County voters approved Measure K, which provided for the use of SamTrans funds for a BART extension beyond Colma to the San Francisco Airport. In June 1994, San Francisco voters approved Proposition I, directing San Francisco officials to "take all actions necessary" to extend BART service into the airport terminal area.

The BART extension also has strong regional support, as demonstrated by a number of actions by public agencies. In 1988, MTC, the regional entity responsible for assigning transportation priorities and channeling state and federal funds, approved Resolution No. 1876, which (as amended in 1989) affirms the priority status of the BART–San Francisco Airport Extension for federal funding. In April 1996, the Governor of California notified the U.S. Senate Appropriations Committee that the project is one of the top three priority transportation projects in the state.

1.3 Goals and Objectives

The goals and objectives of the BART–San Francisco Airport Extension were initially developed as part of the initial planning process, from 1989 to 1992. Each of the goals and objectives, presented in Table 1-1, were equally instrumental in developing the range of alternatives considered throughout the environmental and conceptual engineering processes and in evaluating the merits of the alternatives suggested by BART/SamTrans, other public agencies, and the public. The Aerial Design Option LPA rates "high" in achieving the eight project goals.

1.4 Intended Uses of the FEIR/FEIS

Since the use of federal funds is contemplated to implement the Aerial Design Option LPA, FTA will use this FEIR/FEIS in support of its funding approval process. Similarly, SamTrans and other local agencies will rely upon these environmental documents as a basis for review and approval of the proposed project. Table 1-2 lists public agencies that may consult this document and their area of approval authority.

1.5 Organization of the FEIR/FEIS

The FEIR/FEIS for the BART extension is composed of five volumes and an Executive Summary. This first volume of the FEIR/FEIS presents the impact analyses and mitigation measures for the Aerial Design Option LPA. The analysis reflects design refinements incorporated into the LPA as well as clarifications and corrections resulting from public comments on the January and September 1995 draft environmental documents. Volume II of this FEIR/FEIS includes written and oral comments made during the public review of the January 1995 DEIR/SDEIS, and responses to those comments. Volume III contains comments and responses associated with the FRDEIR/S#2DEIS of September 1995. Volume IV presents

Table 1–1
Goals and Objectives

GOAL 1	**Mobility.** Provide a balanced transportation system that promotes the safe and efficient movement of people within the project corridor.
Objectives	• Relieve increasing congestion on the highway network and street system by promoting alternatives to single-occupant automobiles; • Maximize the use of public transportation, particularly during peak commute periods; • Develop a coordinated transit system that links local and regional transit systems; • Design a system that accommodates a future BART extension to the south; • Design the system so that it satisfies BART/CalTrain/SFIA design, operational, and safety criteria.
GOAL 2	**Environmental Considerations.** Preserve and enhance the environment.
Objectives	• Support implementation of the Bay Area Clean Air Plan, aimed at attaining state and federal ambient air quality standards; • Minimize potential adverse impacts to the corridor's natural resources, particularly wetlands and habitat for identified endangered species; • Minimize potential adverse impacts to the built environment; • Minimize exposure to natural hazards.
GOAL 3	**Land Use and Development.** Develop a transportation system in the project corridor that is integrated with adjacent land uses and with planned development.
Objectives	• Provide a transportation system that will encourage private investment and commercial activity in existing and planned activity centers; • Minimize to the maximum extent possible displacement and disruption of existing land uses; • Minimize disturbances to neighborhood character resulting from significant changes in traffic flow, introduction of facilities that are out of scale with existing development, loss of important social or recreational facilities, and disruption of well-defined pedestrian areas.
GOAL 4	**Financial Feasibility.** Develop transportation systems based on a realistic estimate of available resources.
Objectives	• Develop a transportation system that can be funded by the parties sharing the costs; • Investigate opportunities to identify low-cost design options in the development of transportation facilities.
GOAL 5	**Equity.** Design a transportation system that meets the needs of all social groups, particularly the poor, elderly, disabled, young, and other transportation disadvantaged.
Objectives	• Increase the mobility of the transportation disadvantaged; • Seek a fair distribution of costs and benefits among various social groups.
GOAL 6	**Community and Institutional Considerations.** Maximize community acceptance and political and institutional support of the project.
Objectives	• Provide transportation solutions consistent with federal, state, regional, and local goals and objectives to the greatest extent possible; • Provide for a participation process in the development of transportation plans that is open and understandable to the general public.
GOAL 7	**Effectiveness.** Provide an effective addition to the regional transit system.
Objectives	• Provide intermodal connection (between various transit modes, e.g., BART, SamTrans, CalTrain); • Develop transit alternatives that are convenient for passengers; • Maximize transit patronage.
GOAL 8	**Operational Efficiency.** Provide an efficient transit system.
Objectives	• Minimize travel time; • Provide for efficient transit operations.

Sources: AA/DEIS/DEIR, March 1992.

Table 1-2
Agencies with Review, Permit and/or Approval Authority

Agency	Type of Review/Approval
Federal	
Federal Transit Administration	Lead federal agency for EIS; granting of funding; conformity evaluation under Clean Air Act
U.S. Environmental Protection Agency	Section 404 permit oversight; federal air quality conformity
U.S. Department of Interior, Fish and Wildlife Service	Section 9 (endangered species) review and consultation with the Environmental Protection Agency
U.S. Department of the Interior	Section 4(f) review
U.S. Army Corps of Engineers	Section 404 permits for fill and discharge to wetlands
Federal Highway Administration	Possible encroachment permits
Federal Aviation Administration	Submission and approval of revised SFIA airport layout plan into the SFIA
Advisory Council on Historic Preservation	Section 106 review
State	
Department of Fish and Game	Section 1601 review; endangered species evaluation
Department of Transportation (Caltrans)	Possible encroachment of federal and state-funded highways requiring the use of a Caltrans Encroachment Permit
Public Utilities Commission	Operating/safety approvals
State Historic Preservation Office	Review and final approval of Historic Property Survey and Effects Reports; party to Memorandum of Agreement for any adverse effects to historic properties
Regional	
Regional Water Quality Control Board	Permits for operation (National Pollution Discharge Elimination System, etc.)
Bay Area Air Quality Management District	Permits for equipment and processes; air quality conformity
Metropolitan Transportation Commission	Funding decisions; air quality conformity
Peninsula Corridor Joint Powers Board	Review effects on CalTrain; approval of temporary relocations; coordination during construction
Local	
BART and SamTrans	Co-lead agencies for EIR; approval of project and expenditure of funds
San Francisco Airports Commission	Coordination, planning, design, and construction of BART facilities on SFIA property from the westerly border of Highway 101, including connection to the Airport Light Rail System; funding source for the project
Local Cities	Approvals related to roads and public utilities
San Mateo County Flood Control District	Channel modification and overcrossing approval
Private Utilities	Service connections and relocation of conflicting facilities

Source: BART, 1996

the design drawings for the Aerial Design Option LPA. Volume V contains technical appendices concerning primarily cultural and biological resources. The Executive Summary is a succinct document highlighting the environmental process, the various reports prepared as part of this process, and the impacts and mitigations for the alternatives evaluated. Figure 1-1 shows the documents comprising the FEIR/FEIS and their relationship to the earlier January and September 1995 drafts.

1.6 Organization of Volume I

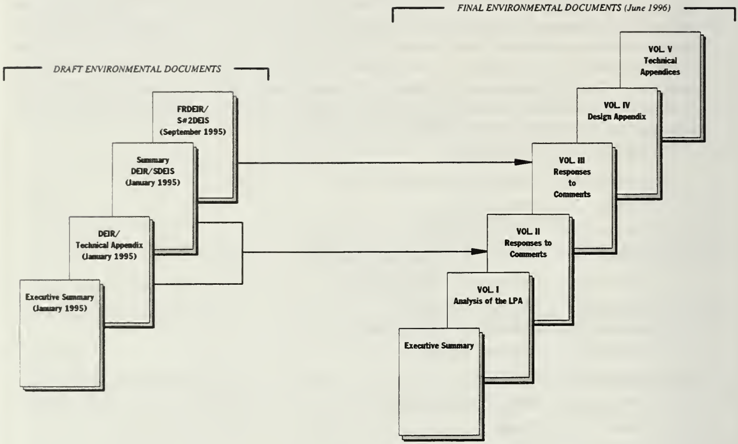
Volume I is a synthesis of the DEIR/SDEIS and the FRDEIR/S#2DEIS in that it presents and updates information from those reports relevant to the Aerial Design Option LPA. Its overall structure and organization are identical to those of the draft environmental documents. The fundamental difference is that the environmental analyses in this document address only the Aerial Design Option LPA. This focus on the selected LPA is performed in accordance with FTA procedures for preparing final NEPA documents. Chapter 2 presents a description of the Aerial Design Option LPA and other alternatives considered in the draft environmental documents. Chapter 3 provides environmental analysis of the following areas, including existing conditions and impact analyses:

Section 3.1	Transportation
Section 3.2	Land Use and Economic Activity
Section 3.3	Visual Quality
Section 3.4	Cultural Resources
Section 3.5	Community Services and Facilities
Section 3.6	Geology, Soils and Seismicity
Section 3.7	Biological Resources
Section 3.8	Hydrology and Water Quality
Section 3.9	Noise and Vibration
Section 3.10	Air Quality
Section 3.11	Public Health and Safety
Section 3.12	Energy
Section 3.13	Construction

Sections 3.1 through 3.12 concern impacts from the BART extension after it is constructed and operational. Those impacts that would occur during the construction period and whose effects are primarily short term are compiled into a separate discussion in Section 3.13. This section contains construction effects for all environmental issues.

Chapter 4 presents a discussion of other required CEQA/NEPA topics (e.g., a listing of unavoidable, unmitigable effects; growth-inducing effects; areas of controversy; and issues to be resolved).

Chapter 5 addresses Section 4(f) of the federal Department of Transportation Act of 1966, concerning loss of parklands, wildlife and waterfowl refuges, and historic resources. Much of the relevant information in this chapter is contained in Section 3.2, Land Use, and Section 3.4, Cultural Resources, but is summarized and formatted per Section 4(f) requirements. This chapter is required only for transportation-related federal projects.



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Organization of the BART–San Francisco Airport Extension Environmental Documents

FIGURE 1-1

Financial information regarding the project's capital and operating and maintenance costs is not required by either CEQA or NEPA, but is provided for informational purposes, in Chapter 6.

Chapter 7 responds to Executive Order No. 12898, enacted February 11, 1994, which requires that federal agencies consider their project's effects on low-income populations and on minority populations. This chapter is required for all federal projects.

Chapter 8 describes the community participation activities undertaken in conjunction with the environmental/preliminary engineering efforts; Chapter 9 identifies background reference materials used to prepare the environmental documents; Chapter 10 presents the individuals responsible for preparing the FEIR/FEIS; and Chapter 11 indicates the agencies, organizations, and individuals receiving copies of the FEIR/FEIS.

Chapter 2
Locally Preferred Alternative and Other Alternatives Considered

2.1 Introduction

This chapter presents a history of the alternative selection process, beginning with the 1989-1992 Alternative Analysis effort and culminating with the selection of the Aerial Design Option LPA in November 1995. The majority of this chapter is devoted to describing the Aerial Design Option LPA with respect to its alignment, stations, and support facilities. Ten other alternatives were considered in the *Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement* (DEIR/SDEIS) and the *Focused Recirculated Draft Environmental Impact Statement/Supplemental #2 Draft Environmental Impact Statement* (FRDEIR/S#2DEIS); these alternatives are summarized at the end of Chapter 2.

2.2 LPA Selection Process

Alternatives Analysis

Initial Set of Alternatives. The Preliminary Alternatives Analysis process, which identified BART service and the Colma-to-San Francisco International Airport (SFIA) corridor for further study, recommended evaluation of seven alternatives. These alternatives ranged from a "No Build" option, to linking northern San Mateo County with San Francisco through enhanced bus and CalTrain service, to extending BART to the SFIA. They were analyzed in the *Alternatives Analysis/Draft Environmental Impact Statement/Draft Environmental Impact Report* (AA/DEIS/DEIR), completed in March 1992, pursuant to the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA).

At the conclusion of the AA/DEIS/DEIR process, BART, SamTrans, and the Metropolitan Transportation Commission (MTC) selected "BART to Airport External via I-380." This alternative called for BART service to the SFIA, with stations in South San Francisco at Hickey Boulevard, in San Bruno adjacent to the Tanforan Park Shopping Center, and opposite the SFIA along the CalTrain tracks. In accordance with Federal Transit Administration (FTA) guidelines, this alternative was designated the Locally Preferred Alternative (LPA), and was to be the subject of further engineering and environmental studies. This recommendation, emerging from the AA process, is referred to in this FEIR/FEIS as the 1992 LPA.

Major Investment Study Requirements. In 1993, FTA modified its requirements for evaluating transit options. The Major Investment Studies (MIS) directed transportation agencies to analyze a range of transportation modes and alignments before making investment decisions, and to inform and involve the public and related agencies in the decision-making process. This new process replaced the AA planning and engineering process, and all projects in the AA phase (which was the case for the BART–San Francisco Airport Extension) were required to be reevaluated for conformance with the MIS requirements. The regional stakeholders, including BART, SamTrans, FTA, MTC, the Peninsula Corridor Joint Powers Board (JPB), San Mateo County Transportation Authority, the Federal Highway Administration and Caltrans, agreed that the BART–San Francisco Airport Extension project had met the

MIS requirements, evidenced by the 20 years of northern Peninsula transit route studies, the over 90 mode and alignment alternatives reviewed, and the numerous opportunities for public input throughout the process.

Final Set of Alternatives. Following publication of the AA/DEIS/DEIR, specific concerns about localized station area impacts, traffic effects, loss of wetlands, and disturbance to endangered species habitat prompted consideration of a revised set of alternatives. During the AA/DEIS/DEIR public review period, substantive comments were received regarding the level of analyses in the AA/DEIS/DEIR. To address these concerns, BART and SamTrans decided to prepare a new, more detailed DEIR and to supplement the DEIS. Since new environmental documents were to be prepared, BART and SamTrans initiated a scoping and screening process, in 1993, in order to determine if any other alternatives should be considered. After screening 19 proposed alternatives, agreement was reached to perform additional environmental analysis on five specific BART build alternatives (three new designs, plus the 1992 LPA and a "Base Case" Alternative from the AA/DEIS/DEIR), the Transportation System Management (TSM) Alternative, and a No Build Alternative. Of the five BART build alternatives, two proposed BART service to a terminal station outside the SFIA terminal area; the other three recommended BART stations on the airport (east of Highway 101).

These alternatives (described in Section 2.3 of this chapter) were evaluated in the September 1995 DEIR/SDEIS. In response to comments on the AA/DEIS/DEIR, this report:

- evaluated the 1992 LPA in greater detail;
- updated and refined the traffic analysis for all alternatives by examining in more detail the local circulation impacts around the proposed station areas;
- defined more accurately the potential loss of wetlands for all alternatives, as well as potential disturbances to threatened and endangered species known to inhabit the project corridor;
- discussed more thoroughly potential construction-period impacts for all alternatives; and
- considered potential cumulative impacts that would stem from implementation of BART alternatives concurrently with other future development, including that envisioned in the 1989 *San Francisco International Airport Final Draft Master Plan* (referred to in this document as the SFIA Master Plan).

On January 13, 1995, BART, SamTrans, and FTA released the BART–San Francisco Airport Extension DEIR/SDEIS for a 60-day public comment period. The DEIR/SDEIS was circulated to approximately 440 agencies, organizations, and individuals and was made available at all libraries and city halls within the project corridor. One hundred and fifty persons testified at public hearings, held February 15, February 18, and March 4, 1995, to collect comments on the DEIR/SDEIS. By the conclusion of the public comment period on March 13, 1995, 298 agencies, organizations, and individuals had submitted written comments on the DEIR/SDEIS. In total, approximately 3,000 discrete written and verbal comments were received.

Selection of a Locally Preferred Alternative

Based on public comment and considerations of transit ridership, service to the SFIA, and environmental impacts, the BART and SamTrans Boards of Directors, on April 27 and 28, 1995, selected "Alternative VI–BART to Millbrae via the planned Airport International Terminal" as the new LPA. This decision identified Alternative VI as the local preference for more detailed engineering and final environmental

documentation. Unlike the 1992 LPA, Alternative VI LPA did not bypass downtown San Bruno, provided an internal airport station, and offered an intermodal connection with CalTrain in Millbrae.

The Alternative VI LPA route followed the San Bruno branch of the SPTCo railroad between Colma and San Bruno, and then merged with the CalTrain mainline through downtown San Bruno. In San Bruno, the BART subway alignment turned southeast under Highway 101 to the planned International Terminal at the SFIA and southwest back under Highway 101 to the CalTrain mainline. This extension terminated at a station in Millbrae, with a tailtrack (for train storage and turning back trains) extending into Burlingame. Stations were located at Hickey Boulevard, Tanforan Park Shopping Center, the SFIA at the planned International Terminal, and at a BART/CalTrain intermodal station at Millbrae Avenue. The Alternative VI LPA called for a subway configuration between the Colma BART Station and South Spruce Avenue in South San Francisco; a retained cut alignment to Euclid Avenue in San Bruno; a subway alignment through downtown San Bruno, turning southeast to the planned Airport International Terminal, and returning to the CalTrain mainline at Hillcrest Boulevard in Millbrae; and an at-grade Millbrae Avenue Station.

The BART and SamTrans Boards of Directors selected Alternative VI for the following reasons:

- **Greatest Community Support.** Daly City, Colma, South San Francisco, San Bruno, and Millbrae registered support of Alternative VI, with conditions.

- **Greatest Improvement in Regional Mobility.** Alternative VI provided the highest level of BART ridership, increased new transit ridership, and provided for intermodal connections among BART, CalTrain, SamTrans, and the SFIA Airport Light Rail System (ALRS).

- **Preservation and Enhancement of the Environment.** The California Department of Fish and Game and the U.S. Environmental Protection Agency commented that the 1992 LPA and other alternatives with an intermodal station west of Highway 101 would result in potentially significant impacts on high-quality wetlands and prime habitat for the San Francisco garter snake. Alternatively, the agencies noted that Alternative VI would likely be the Least Environmentally Damaging Practicable Alternative, since it would result in the fewest impacts to wetlands and the habitat of threatened and endangered species.

- **Direct Connectivity into the Airport.** Alternative VI provided direct service into the SFIA for the highest number of passengers. It offered high-speed, efficient transit service between San Mateo County, the SFIA, San Francisco, and the rest of the Bay Area.

Refinement of the Locally Preferred Alternative

Following the selection of Alternative VI, mandates by the U.S. Congress and MTC to reduce the alternative's costs prompted consideration of an another option for bringing BART service into the SFIA. In particular, BART received a directive from the U.S. Congress House Appropriations Committee to consider less expensive design options into the SFIA, and MTC Resolution No. 2451 supported BART's preliminary engineering grant application to FTA, conditioned partially on the understanding that BART would identify and implement feasible cost-containment strategies for the BART–San Francisco Airport Extension. Rather than tunnel into the SFIA, a design option was developed to carry BART service to the

SFIA along an aerial alignment across Highway 101 and the SFIA property between Highway 101 and the CalTrain mainline. The aerial configuration resulted in a cost savings of approximately $200 million.

The aerial option also served to minimize impacts and disruption at the SFIA during implementation of the ongoing 1989 *San Francisco International Airport Final Draft Master Plan* (referred to in this document as the SFIA Master Plan). This Aerial Design Option to Alternative VI included two optional locations for the aerial station at the proposed Airport International Terminal.

The BART Board of Directors June 29, 1995 motion and the SamTrans Board of Directors July 6, 1995 motion requested evaluation of Option B with an airport station located at the International Terminal. The San Francisco Airports Commission July 25, 1995 motion supported Option X with an airport station located in front of the new International Terminal. To reconcile these motions, the BART Board of Directors and the San Francisco Airports Commission both adopted passenger service quality standards. These standards define a level of service to be accomplished (in terms of walking time to various airport destinations), rather than a specific location for the BART airport station.

Finally, the Aerial Design Option modified the Millbrae Avenue Station plan to incorporate certain elements of the Millbrae Avenue Station Concept Plan, published February 13, 1995 and adopted by the Millbrae City Council in Resolution 95-20. Reexamination of the Millbrae Avenue Station design also responded to SamTrans Resolution No. 1995-45, which in part resolved to facilitate cross-platform transfers between BART and CalTrain at the Millbrae Avenue Station.

These refinements were evaluated in the FRDEIR/S#2DEIS, released in September 1995. A 45-day public comment period and one public hearing for the FRDEIR/S#2DEIS followed publication of the document. The BART and SamTrans boards voted to modify the Alternative VI LPA, based on the findings of the FRDEIR/S#2DEIS, written and oral comments on that document received during the public comment period, and additional engineering and financial data. The boards adopted the Aerial Design Option as the new LPA on November 28, and 29, 1995.

2.3 Description of the Aerial Design Option LPA

The Aerial Design Option LPA would provide a total of 8.2 miles of new revenue service track: 7.4 miles of straight-through mainline track from the Colma BART Station tailtracks to a BART/CalTrain station at Millbrae Avenue, and a 0.8-mile east-west aerial wye-stub perpendicular to the CalTrain/BART mainline terminating at the planned Airport International Terminal (see Figure 2.3-1). (A wye-stub is a track that branches off the mainline track in the shape of a "Y.")

The Aerial Design Option LPA is an option to Alternative VI. In the segment between Angus Avenue in San Bruno and the end of the Millbrae Avenue Station tailtracks in Burlingame, instead of a tunneled subway alignment to the planned Airport International Terminal as in Alternative VI, this design option would provide an east-west aerial wye-stub to the International Terminal, which is being constructed by the SFIA. The Aerial Design Option LPA would also provide straight-through mainline service along the CalTrain right-of-way from the Tanforan Station in San Bruno to a Millbrae BART/CalTrain Station located at Millbrae Avenue.

This section provides further description of the Aerial Design Option LPA, including refinements incorporated into this alternative in response to comments from interested parties on previous environmental documents. Operational characteristics, the project route, alignment configurations, station

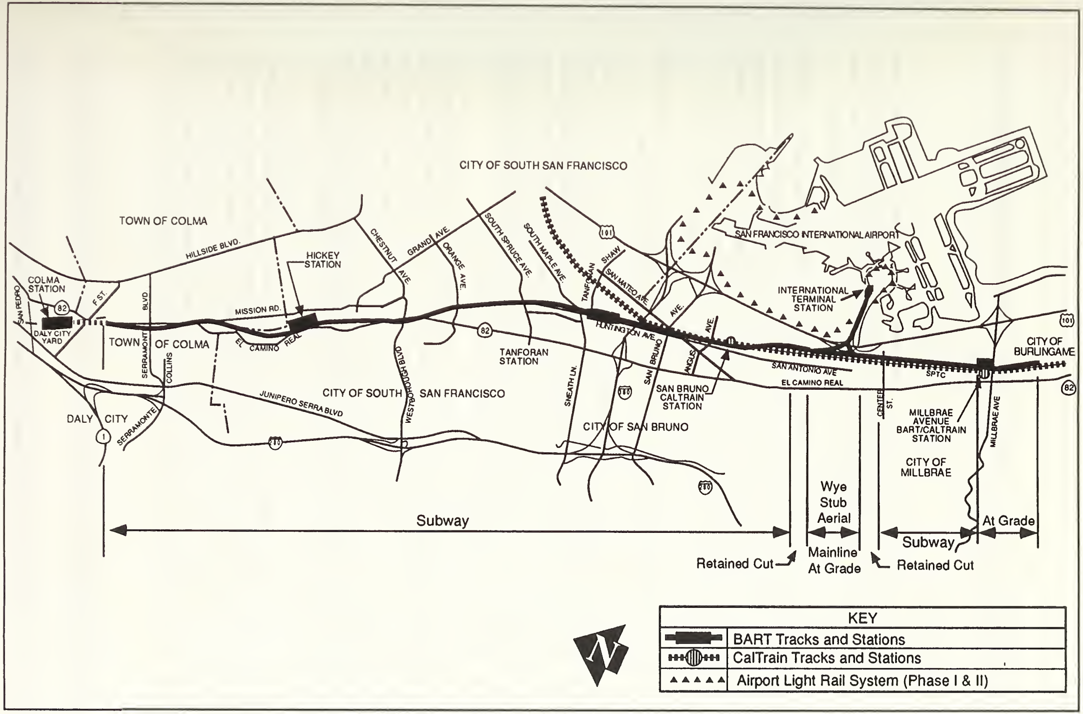


FIGURE 2.3-1

Aerial Design Option LPA

design and ancillary facilities, and road and transit improvements proposed under the Aerial Design Option LPA are also discussed.

System Operations

Conceptual Operating Plan. BART would provide three kinds of service with the Aerial Design Option LPA: 1) service from the East Bay through San Francisco to the Airport International Terminal Station; 2) straight-through mainline service from the East Bay through San Francisco to the Millbrae Avenue Station; and 3) a dedicated Millbrae to SFIA shuttle train. Table 2.3-1 shows the average headways.

Conceptually, during peaks periods, two BART trains would serve the Millbrae Avenue Station on the straight-through mainline alignment for approximately every one serving the Airport International Terminal Station. Peak-period trains through San Francisco to the Airport International Terminal Station would arrive every 13.5 minutes, while trains from Tanforan to Millbrae would have alternating headways of 4.5 and 9 minutes, with an average headway of 6.75 minutes. Where feasible, peak-direction trains would be routed for cross-platform transfers between CalTrain and BART.

BART shuttle train service would operate weekdays and Saturdays, except nights, approximately every 15 minutes and be coordinated with CalTrain northbound arrivals and southbound departures.

Late night weekdays and Saturdays, and all day Sunday, BART would provide a two-route "X" service with trains from North Concord to the West Bay and trains from Richmond to Fremont. During these times, the BART shuttle service would not operate, and the North Concord route through San Francisco would provide service first to the Airport International Terminal Station and then the Millbrae Avenue Station, on 20-minute headways. Persons on the Richmond-to-Fremont route would need to transfer in downtown Oakland to catch a West Bay-bound train. BART trains from Millbrae would also be routed into the Airport International Station and then to San Francisco and the East Bay.

BART's design criteria include a minimum headway of 1.5 minutes between trains. The aerial wye-stub, because of its physical configuration and train control requirements, may have minimum headways of up to three minutes. Per the BART/SamTrans Comprehensive Agreement,[1] the SamTrans Board of Directors, in consultation with the BART Board of Directors, can prescribe the level of service to stations south of the existing Daly City Station. BART must determine that the service levels would be compatible with existing system operations. These BART operating characteristics were assumed for planning purposes for the Aerial Design Option LPA. (As a result, the actual headways may differ from those assumed in Table 2.3-1.)

Bus Service. SamTrans bus routes would be reoriented to serve the stations proposed under the Aerial Design Option LPA. SamTrans feeder bus service to CalTrain stations would be improved, primarily through increased runs on existing routes. SamTrans would operate 11 bus routes, supplying over 750 weekday trips to the proposed Hickey or Tanforan Stations. Eight bus routes providing 200 weekday trips would serve the Millbrae Avenue Station. Bus routes that serve intermodal stations would be used by patrons to access both CalTrain and BART. For further transit information, refer to Section 3.1,

[1] The BART/SamTrans Comprehensive Agreement Pertaining to BART System Extensions, signed March 1, 1990, specified the respective responsibilities of BART and SamTrans for proceeding with necessary environmental work, funding, construction, and operation of the BART extension to the vicinity of the SFIA.

Table 2.3-1
BART–San Francisco Airport Extension
Aerial Design Option LPA
Average Headways (Minutes)

Period	East Bay Service to SFIA	East Bay Service to Millbrae Avenue	East Bay Service to Colma, Hickey and Tanforan Stations [1]	Millbrae to the SFIA
Weekday Service Summary				
Start Up 4AM-6AM	20	20	20	--
AM Peak 6AM - 9:30AM	13.5	6.75 [2]	4.5	15 [3]
Base 9:30AM - 3PM	15	15	7.5	15 [3]
PM Peak 3PM - 7PM	13.5	6.75 [2]	4.5	15 [3]
Night 7PM - 12AM	20	20	20	20
Saturday Service Summary				
Day 6AM - 7PM	20	20	10	20 [3]
Night 7PM - 12AM	20	20	20	20
Sunday Service Summary				
Day 8AM - 7PM	20	20	20	20
Night 7PM - 12AM	20	20	20	20

1) This column shows the combined headways at the Colma, Hickey, and Tanforan Stations of East Bay service to either the Airport International Terminal Station or the Millbrae Avenue Station.

2) Trains from Tanforan to Millbrae would have alternating headways of 4.5 and 9 minutes resulting in an average headway of 6.75 minutes.

3) Shuttle train service between Millbrae Avenue and the Airport International Terminal Station.

Transportation of Chapter 3. These changes in SamTrans transit service, as part of the proposed project, are assessed in the environmental analysis presented in Chapter 3 of this document.

Route and Alignment

The following discussion describes the proposed route and vertical alignment (i.e. below ground, at grade, or aerial) of the BART tracks. Refinements to the route and alignment since adoption of the Aerial Design Option LPA in November 1995 are also noted. These modifications are based on comments received during the review period for the draft environmental documents and on further engineering work. None of these refinements would trigger significant environmental impacts. In fact, most of them effectively reduce impacts identified in the DEIR/SDEIS and the FRDEIR/S#2DEIS. Details of the project's route and vertical alignment are contained in Volume IV, Design Appendix, of this FEIR/FEIS.

Town of Colma. The Aerial Design Option LPA would follow the SPTCo railroad (San Bruno branch) right-of-way in Colma. The alignment would begin at the end of the Colma BART Station tailtracks and extend south in a subway box. The alignment would traverse the cemetery area in Colma between the Italian Cemetery and Mission Road. From Mission Road to the city limits of the Town of Colma near the proposed extension of Hickey Boulevard, the proposed project would continue in subway.

City of South San Francisco. From the city limits of South San Francisco, just north of the proposed subway station at the future extension of Hickey Boulevard, the alignment would continue in a subway box within the SPTCo right-of-way for approximately 1.4 miles to South Spruce Avenue, passing under Colma Creek, Chestnut Avenue, Twelve Mile Creek, and Orange Avenue.

In response to comments by Colma, South San Francisco, and the San Mateo County Flood Control District on the draft environmental documents, the alignment around the Hickey Station was refined to minimize flood impacts. Specifically, the Aerial Design Option LPA incorporates drainage improvements to Colma Creek, including:

- construction of a trapezoidal channel directly above the proposed BART subway immediately south of Mission Road;
- construction of an open, trapezoidal, 200-foot connector channel north of Hickey Boulevard to connect the existing Colma Creek channel to the proposed channel;
- widening the existing open, trapezoidal channel north of Hickey Boulevard following the old SPTCo right-of-way; and
- widening and realigning the existing open channel from the Hickey Station to Oak Avenue.

These Colma Creek design refinements are contained in Alternative II of the *Colma Creek Improvements Validation Study* by Reimer Associates (February 16, 1995) and are presented in Volume IV, Design Appendix, of this FEIR/FEIS.

A second design refinement to the proposed project, suggested by the City of South San Francisco to avoid the significant impacts of raising South Spruce Avenue, would lower the BART subway alignment to maintain the existing South Spruce Avenue profile. Lowering the BART subway profile under South Spruce Avenue in South San Francisco (as opposed to raising the alignment) would mitigate impacts on local circulation, access for properties along the street, and an adjacent play lot.

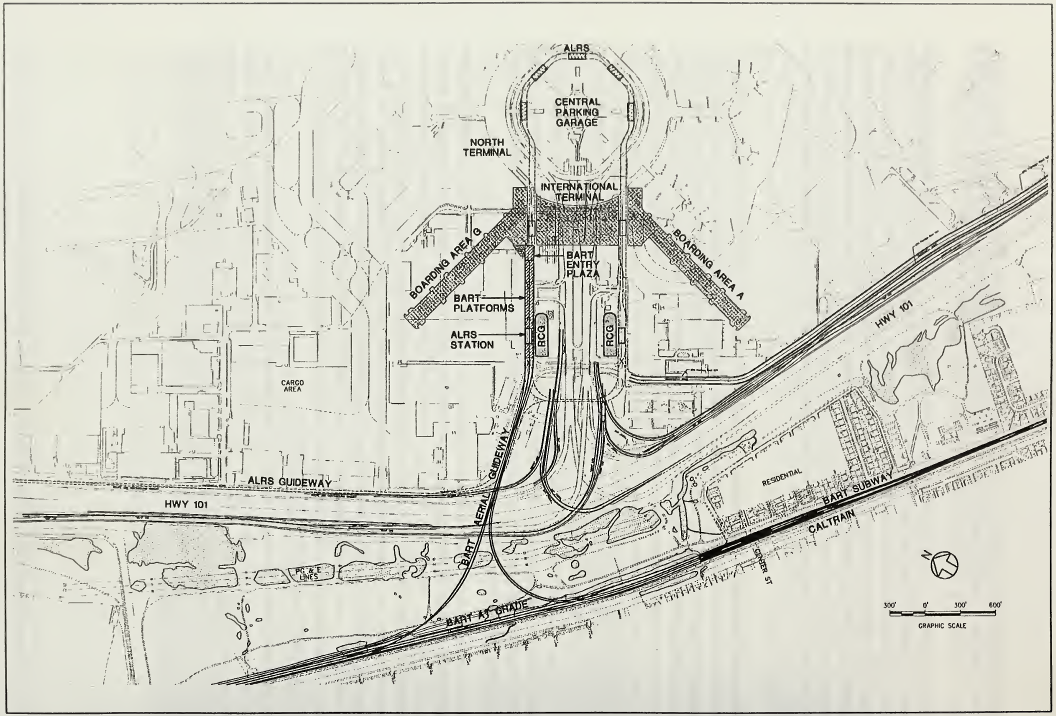
South of South Spruce Avenue, the BART subway alignment would shift east into the San Francisco Water Department right-of-way in order to align with the redesigned Tanforan Station, as discussed below. The change in alignment from retained cut to subway would reduce noise and visual impacts.

City of San Bruno. The alignment would continue in a subway box from the South San Francisco/San Bruno city limits, through the Tanforan Station and downtown San Bruno. South of Angus Avenue, the subway alignment would transition from the west to the east side of the CalTrain tracks between Sylvan Avenue and Cupid Row. The subway box would then rise to the surface at a portal located between Georgia and San Felipe Avenues. South of San Felipe Avenue, the mainline would continue south parallel to the CalTrain tracks to the Millbrae Avenue Station. Between San Felipe Avenue and the San Bruno/Millbrae city boundary, south of Santa Helena Avenue, the BART mainline tracks would be at grade.

SFIA Aerial Wye-Stub. The wye-stub north and south legs would ascend from subway to retained cut parallel to the CalTrain tracks, transition to at-grade then to aerial, and curve east on aerial structures. The aerial structures would ascend and cross over the SFIA west of Bayshore property and under the raised PG&E transmission line. Over Highway 101, the north and south legs of the wye join to form one structure, with three tracks parallel to the SFIA north access road. The aerial structure would cross Highway 101 and the existing elevated highway ramps to the SFIA, approximately 50 feet above grade, and stop at the airport station 44 feet above grade, approximately 130 feet in front of the airport's planned International Terminal building (see Figure 2.3-2). The station would feature two passenger platforms, with a total of three tracks for trains. Crossovers between tracks to facilitate train operations would also be provided at the following locations: over Highway 101, the highway viaduct, and across from the United Airlines administration building. From the Colma Station to the Airport International Terminal Station, the alignment is 6.5 miles. The distance between the Airport International Terminal Station and the Millbrae Avenue Station is 1.7 miles.

City of Millbrae. From Santa Helena Avenue to the south boundary of Lomita Park School, the mainline tracks would be at grade; the eastbound and westbound tracks of the south leg of the wye would descend on aerial columns, curve to the southwest over the mainline tracks, and descend to grade. South of Lomita Park School, the mainline and the south leg of the wye would descend parallel to each other in retained cut and enter a subway portal approximately 300 feet north of Madrone Street. The BART alignment would be in a subway box between north of Madrone Street and San Rey Avenue, and then rise in retained cut to an at-grade alignment 200 feet north of the Millbrae Avenue Station. South of the station, the at-grade turnback/tailtracks would extend a total of approximately 2,200 feet, approximately 700 feet in Millbrae and 1,500 feet in Burlingame.

City of Burlingame. The 1,500 feet of at-grade turnback/tailtracks in Burlingame are in the CalTrain right-of-way south of Murchison Drive. One of the four tailtracks would accommodate BART shuttle train service to/from the SFIA. The track for the shuttle train would extend approximately 1,200 feet south of the Millbrae Avenue Station platform, approximately 700 feet in Millbrae and approximately 500 feet in Burlingame. Train storage for up to 60 BART cars would be provided on the tailtracks south of the Millbrae Avenue Station.



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Aerial Design Option to the Airport International Terminal

FIGURE 2.3-2

Station Design Features

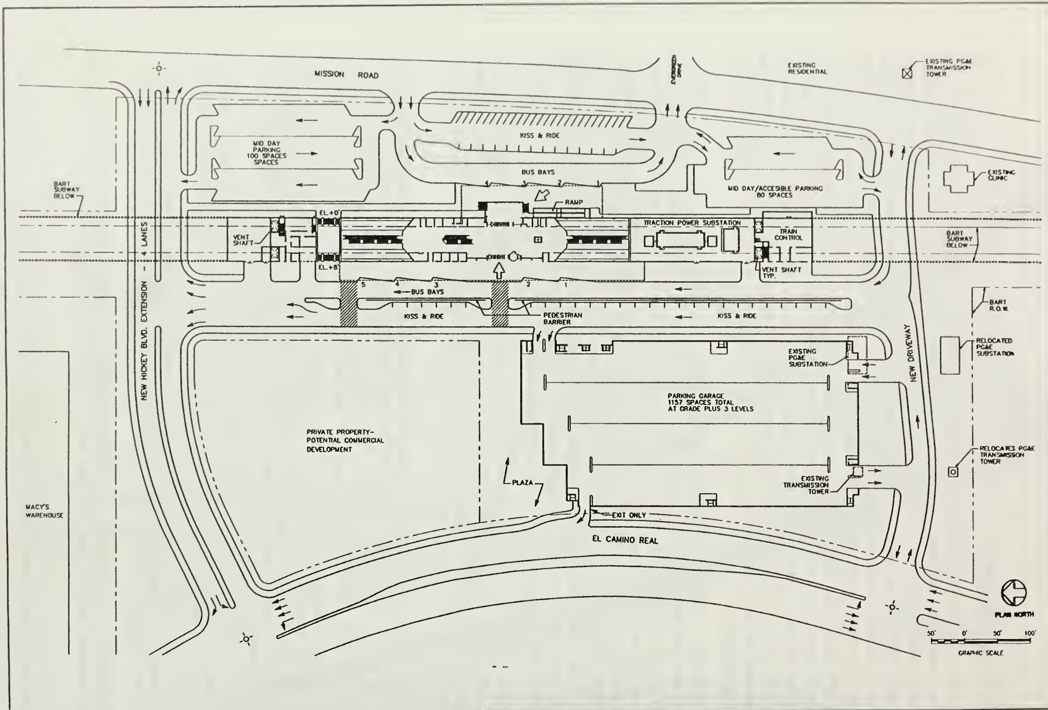
Four stations are proposed as part of the Aerial Design Option LPA. BART stations typically consist of a platform with waiting areas and tracks on either side, stairs and escalators leading to the platform from a paid area or mezzanine, a free area with fare equipment, and a structure covering the station areas. Inside most station buildings are internal areas designated for station agents, security, electrical and mechanical equipment, maintenance and storage of supplies, public toilets, and concession areas. Outside the station structure are waiting areas, bus loading zones, bike storage areas, kiss-and-ride (drop-off and pick-up) areas, and, usually, parking lots and/or parking structures. In the case of the Airport International Terminal Station, there would be no parking facilities. Parking and other facilities for disabled persons would be provided to meet state and federal requirements regarding accessibility. Specific features of each station are described below. Design refinements to the Tanforan Station are noted and have been incorporated into the project in order to minimize effects noted for this station in the DEIR/SDEIS and the FRDEIR/S#2DEIS.

Hickey Station. The Hickey Station in South San Francisco would be in a subway along the SPTCo right-of-way, just south of the at-grade extension of Hickey Boulevard between Mission Road to the east and El Camino Real to the west (see Figure 2.3-3). The Hickey Boulevard extension from El Camino Real and Mission Road is part of the proposed project. The Hickey Station would have approximately 1,337 parking spaces (1,157 in a four-level parking structure and 180 surface spaces for midday and accessible parking). Park-and-ride and kiss-and-ride access would be separated from bus movements (see Figure 2.3-4). The primary access for both feeder bus service and autos would be via El Camino Real, with secondary access from Mission Road. An existing PG&E substation, transmission tower, and associated transmission lines would be relocated approximately 100 feet south of the station.

Tanforan Station. The Tanforan Station plan of the Aerial Design Option LPA has been modified to incorporate certain elements of the Tanforan/BART Concept Plan jointly submitted by the Hapsmith Company and the City of San Bruno (see Figure 2.3-5). Key features of the design refinements to the Tanforan Station and alignment in the station vicinity include:

- The subway station would be located immediately adjacent to the Tanforan Park Shopping Center and west of Huntington Avenue (west) in San Bruno (see Figure 2.3-6). South of South Spruce Avenue, the alignment would be in subway and shift east into the San Francisco Water Department right-of-way in order to align with the Tanforan Station. South of the Tanforan Station, the subway alignment would shift back east to the SPTCo right-of-way near Forest Lane.
- Existing Huntington Avenue west would be realigned by reconstructing the roadway to the east immediately adjacent to Huntington Avenue East, while BART tracks would be constructed in subway immediately adjacent to the Tanforan Park Shopping Center. Huntington Avenue (west) would be reconstructed and widened to accommodate two through lanes in each direction from the intersection of Sneath Lane south to and including Herman/Forest Lane.
- A separate, approximately 1,000-space, four-level parking structure for BART patrons would be built immediately east of the Sears Tire, Auto and Battery Center. The entrance/exit to this garage on Huntington Avenue would be signalized.
- Eight bus bays would be provided adjacent to the station concourse. Primary feeder bus access would be via Huntington Avenue and Sneath Lane. The BART parking garage and kiss-and-ride/accessible parking would be separated from bus movements.

These refinements would minimize noise and visual impacts on the Fifth Addition neighborhood and create a station design that is better integrated with the Tanforan Park Shopping Center.



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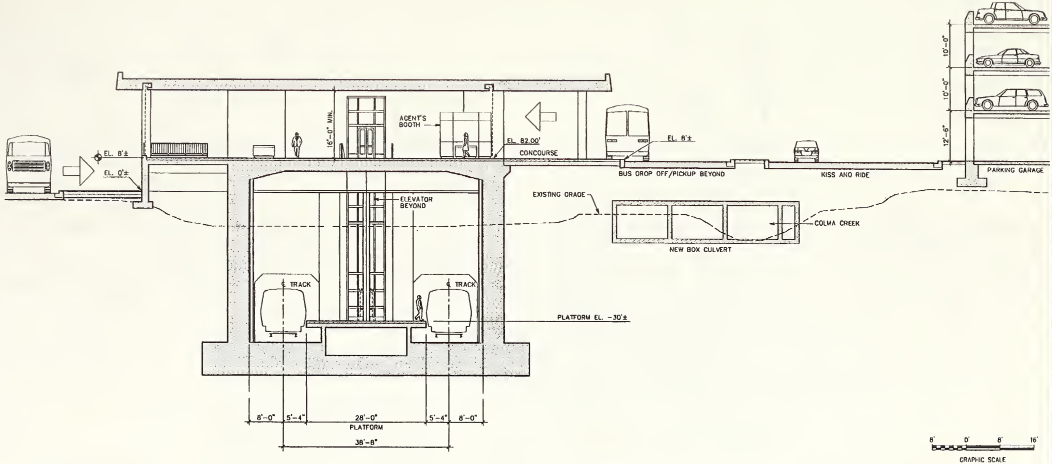
Hickey Station Site Plan
(South San Francisco Station)

FIGURE 2.3-3



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Hickey Station Section (South San Francisco Station)

FIGURE 2.3-4

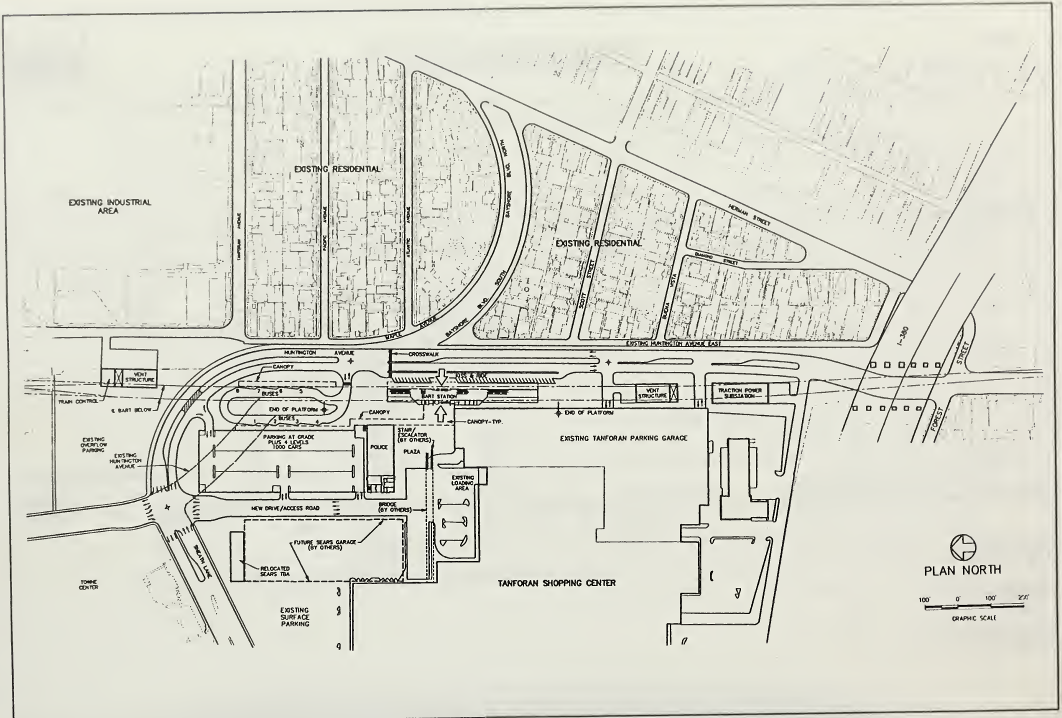

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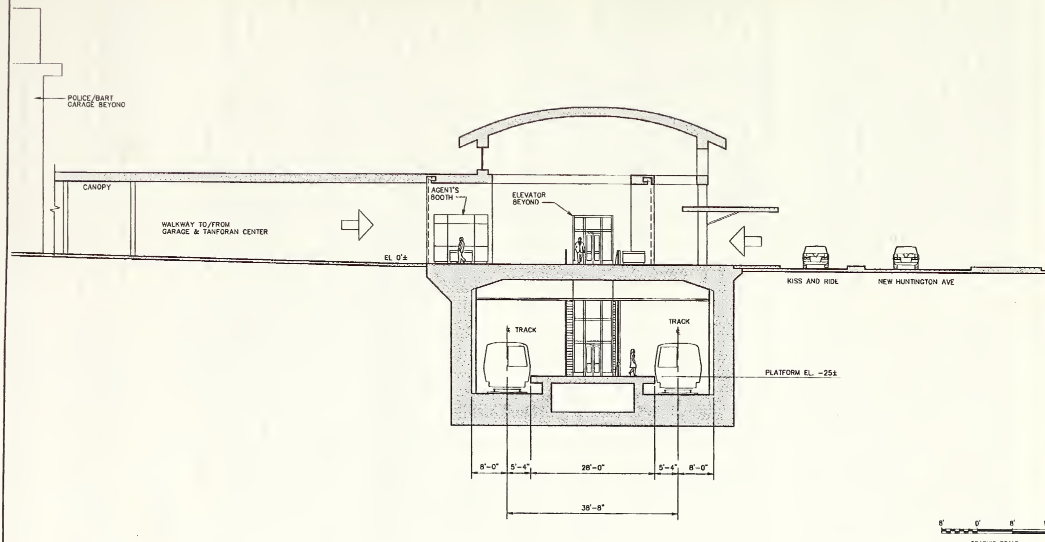
FIGURE 2.3-5

Tanforan Station Site Plan (San Bruno Station)



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Tanforan Station Section (San Bruno Station)

FIGURE 2.3-6

Airport International Terminal Station. This station would be constructed in an elevated configuration, with its eastern end approximately 130 feet in front (west) of the western face of the planned International Terminal (see Figure 2.3-7). The station platform, with three tracks, would be approximately 44 feet above grade at the departure level of the International Terminal, and one level below the ALRS Station at the Ground Transportation Center/Rental Car Garage (GTC/RCG) (see Figure 2.3-8). The North Terminal (United Airlines) would be reached by walking and riding a moving sidewalk, or taking an escalator up one level and then transferring to the planned ALRS Station at the GTC/RCG. Other terminals could be accessed by transferring to the planned ALRS Station at the GTC/RCG or walking. The United Airlines maintenance facility and other employee areas north of the terminals would be accessed by transferring to the ALRS. No BART patron parking would be provided at the station.

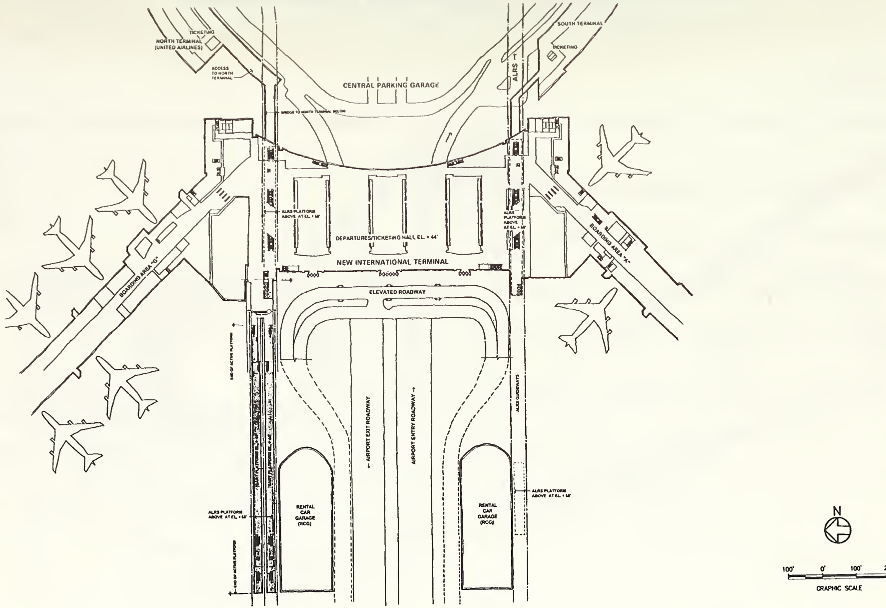
The proposed Airport International Terminal Station would satisfy all of the Passenger Service Quality Standards adopted by the BART board on September 12, 1995 and the San Francisco Airports Commission on September 19, 1995. At least 50 percent of passengers arriving on BART would be able to reach the first ticket counter at their selected airline terminal location from the midpoint of the BART platform within a four- to five-minute walk without transfers. Moving sidewalks would be added inside the International Terminal to the United Airlines North Terminal, and additional elevators and escalators would be provided for passenger convenience. Baggage check-in would also be provided at the east end of the BART platform. Convenient access to the ALRS, one level above the BART station, would be available via escalator or elevator. Appropriate architectural treatment and fully integrated graphics and signage to provide a user-friendly atmosphere would be incorporated during final design.

The Airport International Terminal Station would also interface with a number of SFIA Master Plan improvements, including the International Terminal, GTC/RCG, ALRS, and new highway ramps (see Figures 2.3-9 and 2.3-10).

Millbrae Avenue Station. The at-grade Millbrae Avenue Station, shown in Figure 2.3-11, would serve both BART and CalTrain. The existing Millbrae CalTrain Station platform would be relocated to the BART/CalTrain Millbrae Avenue Station approximately 800 feet north. The Millbrae Avenue Station would incorporate three BART tracks with one center and one side platform to facilitate train movements and the cross-platform transfer as a design refinement (see Figure 2.3-12). One CalTrain/BART platform would provide for cross-platform transfers, with other transfers by an aerial bridge. Approximately 3,000 parking spaces would be provided (approximately 2,085 in a four-story parking structure and approximately 915 in three surface lots). A pedestrian bridge would connect the parking structure and surface parking with the BART and CalTrain mezzanines. The main vehicular access for commuters from the south would be via Highway 101 and Millbrae Avenue. Local access to the station would primarily be via Millbrae Avenue, El Camino Real, Rollins Road, or California Drive. A new connection is also proposed between the BART parking garage and Adrian Road south of Millbrae Avenue. As part of the Millbrae Avenue grade separation project, California Drive is being extended to Linden Avenue. The California Drive extension would provide access to the station from the west.

Ancillary Facilities

Key ancillary facilities include ancillary tracks, a car wash, traction power substations and feed facilities, access roads, ventilation buildings, and tailtracks. Ancillary tracks are needed for operational flexibility and maintenance. Traction power substations take 34,500-volt electricity from PG&E and use



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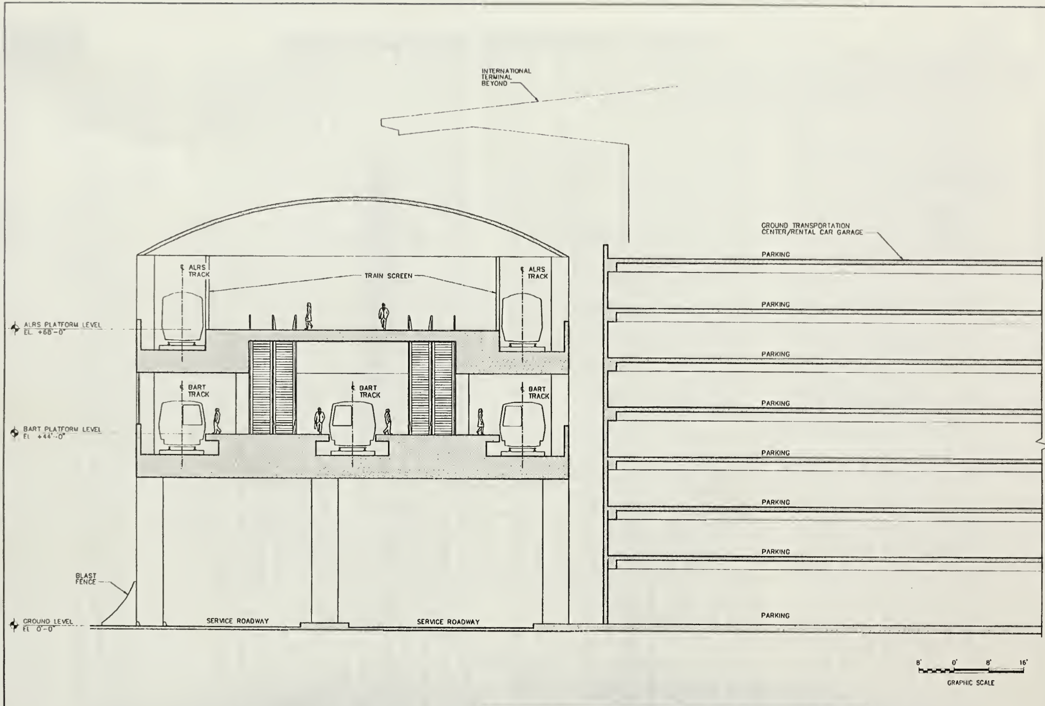
Airport International Terminal Station Site Plan

FIGURE 2.3-7



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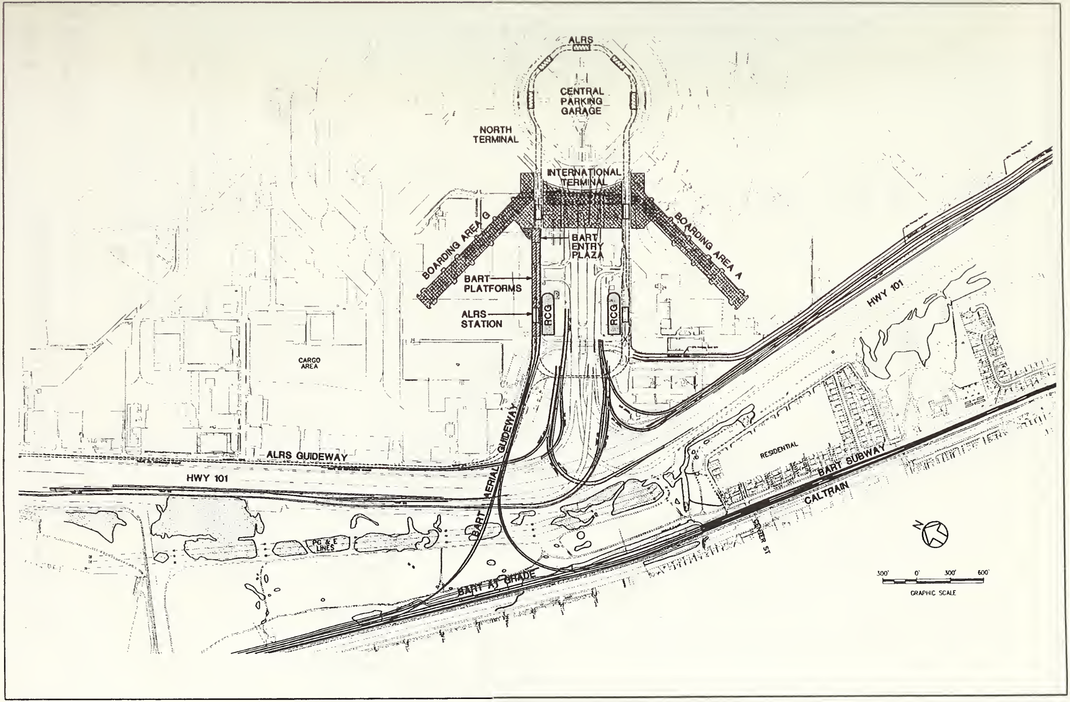
Section of BART & ALRS Stations at GTC/RCG

FIGURE 2.3-8



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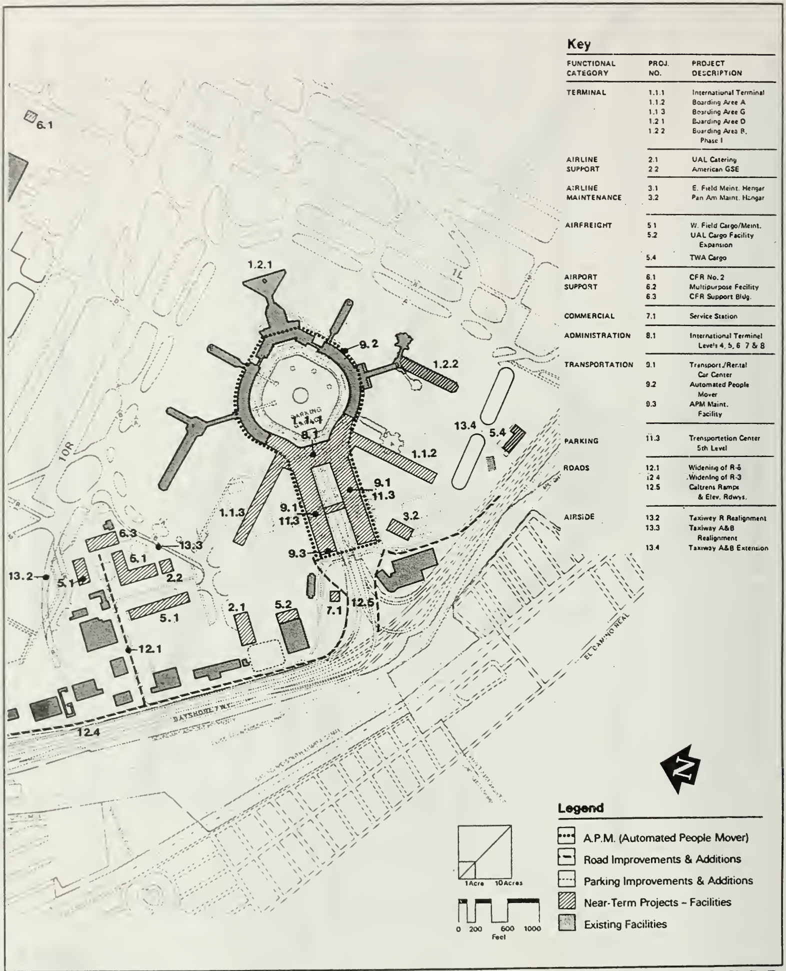
BART Interface with San Francisco Airport Master Plan Projects

FIGURE 2.3-9



Key

FUNCTIONAL CATEGORY	PROJ. NO.	PROJECT DESCRIPTION
TERMINAL	1.1.1	International Terminal
	1.1.2	Boarding Aree A
	1.1 3	Boarding Aree G
	1.2 1	Boarding Aree D
	1.2 2	Boarding Area B, Phase I
AIRLINE SUPPORT	2.1	UAL Catering
	2 2	American GSE
AIRLINE MAINTENANCE	3.1	E. Field Meint. Hengar
	3.2	Pan Am Maint. Hangar
AIRFREIGHT	5 1	W. Field Cargo/Meint.
	5.2	UAL Cargo Facility Expansion
	5.4	TWA Cargo
AIRPORT SUPPORT	6.1	CFR No. 2
	6.2	Multipurpose Fecility
	6.3	CFR Support Bldg.
COMMERCIAL	7.1	Service Station
ADMINISTRATION	8.1	International Terminel Levels 4, 5, 6 7 & 8
TRANSPORTATION	9.1	Transport./Rental Car Center
	9.2	Automated People Mover
	9.3	APM Maint. Facility
PARKING	11.3	Trensportetion Center 5th Level
ROADS	12.1	Widening of R-5
	12 4	Widening of R-3
	12.5	Caltrens Ramps & Elev. Rdwys.
AIRSIDE	13.2	Taxiwey R Realignment
	13.3	Taxiway A&B Realignment
	13.4	Taxiway A&B Extension

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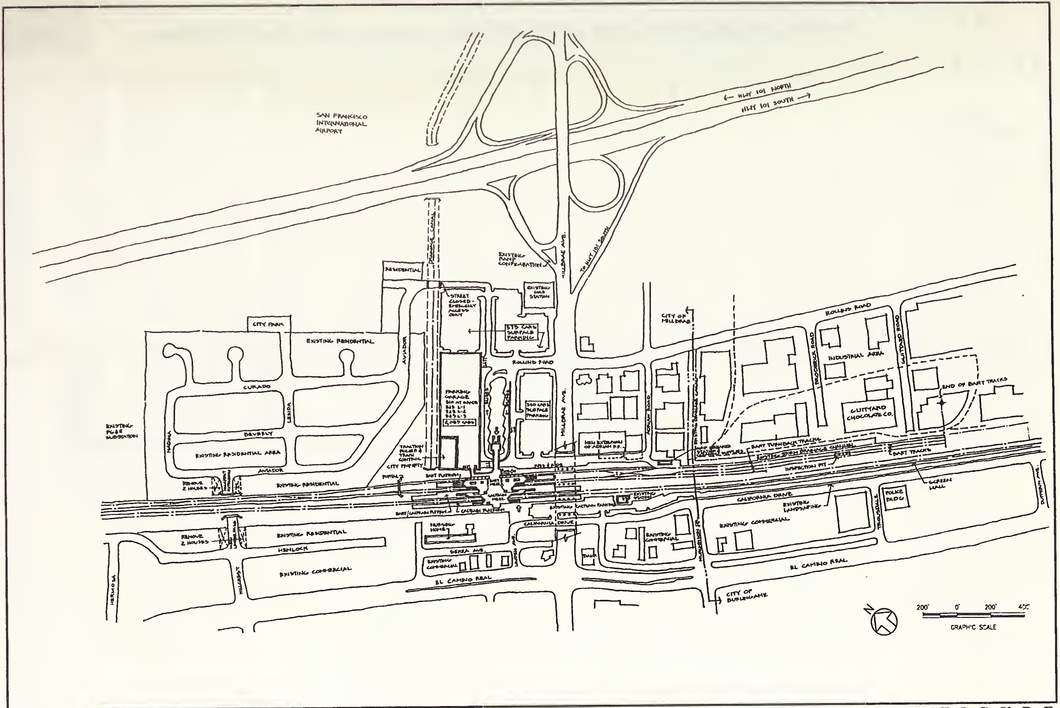
San Francisco Airport Near-Term Master Plan

FIGURE 2.3-10



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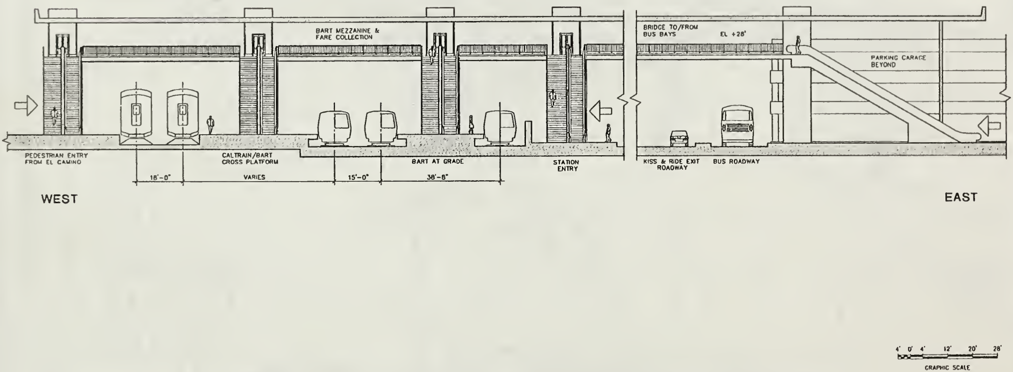
Millbrae Avenue BART/CalTrain Station Site Plan

FIGURE 2.3-11



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Millbrae Avenue BART/CalTrain Station Section with Cross Platform Transfer

FIGURE 2.3-12

transformers to reduce the voltage and rectifiers to convert the alternating current to 1,000-volt direct current. This current is supplied to the third rail to power BART trains. Ventilation buildings include large fan rooms and air shafts to circulate air in underground portions of the alignment. Tailtracks are storage tracks and facilities to turn back trains at the end of the line. Other ancillary facilities include train control bungalows, joint breaker stations, inspection pits, and radio antennae for communications throughout the system.

Daly City Shop/Yard and Colma Station Modifications. The existing Daly City Shop and Yard, which provides for maintenance and storage of BART vehicles in the West Bay, would be modified to handle maintenance requirements for the BART–San Francisco Airport Extension. The shop and inspection building would provide a maintenance pit for four transit vehicles and a wheel truing machine in an area currently occupied by a run-around track. A one-car turntable for turning around BART vehicles would be located at the south end of the yard, which is currently used for train storage. The above modifications to the Daly City Shop and Yard would reduce storage capacity from approximately 165 to 135 vehicles. With the start of operations of BART revenue service to the SFIA and Millbrae, an additional emergency exit walkway and stairs would be needed at the Colma Station. This emergency exit would be constructed at the north end of the Colma Station platform and lead via stairs to the north side to the Hill Street parking structure access bridge. A car wash facility would be located adjacent to the beginning of the Colma Station tailtracks at the Daly City Yard, a design refinement incorporated as part of the Aerial Design Option LPA. The car wash had been located along the BART tracks on the SFIA parcel west of Highway 101. Relocation of the car wash facility from the SFIA west of Highway 101 parcel would avoid impacts to the wetlands and to habitat of the endangered San Francisco garter snake.

Hickey Station Area. A traction power substation, train control bungalow, a 25-foot radio antenna on top of the parking structure, and two tunnel ventilation shafts would be located at the Hickey Station.

Tanforan Station Area. An approximately 800-foot subway pocket track would be located between the northbound and southbound tracks with crossovers near Browning Way and Pacific Avenue. The pocket track would provide storage for up to ten cars, provide failure management, and enable the turning back of trains north of the Tanforan Station for operational flexibility. A ventilation structure would be located north of Tanforan Avenue on the existing overflow parking lot. A traction power substation and train control bungalow would be located on the abandoned SPTCo San Bruno branch about 200 feet north of Tanforan Avenue. A 25-foot radio antenna would be located on top of the BART parking structure. A ventilation structure would be located adjacent to the existing Tanforan Park Shopping Center garage across from Buena Vista Avenue.

Airport International Terminal Station. A traction power substation and train control bungalow would be located at grade and immediately east of Highway 101 under the aerial alignment.

Millbrae Avenue Station. Two single crossovers would be located just north of the Millbrae Avenue Station platform. A 25-foot radio antenna would be located on the roof of the parking structure. A traction power substation would be located on the east side of the parking structure. A train control bungalow would be located north of the existing storm drainage channel and on the east side of the CalTrain right-of-way. A gap breaker station would be located at Murchison Drive. A crossover complex and turnback/tailtrack would be located just south of the station platform in the City of Millbrae.

Burlingame. An enclosed one-car emergency inspection pit would be located along the turnback/tailtrack tracks in Burlingame.

Other Ancillary Facilities. The following additional ancillary facilities are proposed along the BART alignment, from north to south:

Colma

- a ventilation building along the subway alignment approximately 200 feet south of Serramonte Boulevard; and
- a train control bungalow and ventilation building along the subway alignment behind the American Monument Company.

South San Francisco

- a ventilation building over the subway alignment approximately 1,000 feet north of Chestnut Avenue;
- a ventilation building and train control bungalow about 600 feet north of West Orange Avenue; and
- a ventilation shaft and traction power substation about 600 feet north of South Spruce Avenue.

San Bruno

- a ventilation building above the subway alignment across from Browning Way;
- a ventilation building above the subway alignment 300 feet south of Euclid Avenue;
- a ventilation shaft above the subway alignment across from Sylvan Avenue;
- a traction power substation, train control bungalow, and a 25-foot radio antenna at the site of the existing San Bruno CalTrain Station;
- a gap breaker station at grade across from San Felipe Avenue east of the CalTrain tracks in San Bruno; and
- a sound wall between the BART and CalTrain mainline right-of-way from approximately 400 feet north of San Felipe Avenue to the subway portal approximately 300 feet north of Madrone Street in Millbrae.

Millbrae

- a gap breaker station east of the CalTrain tracks south of Center Street; and
- a ventilation shaft above the subway alignment across from Mateo Avenue.

Burlingame

- a wall from Murchison Drive to Dufferin Avenue between the CalTrain tracks and the existing Millbrae CalTrain parking area.

Electrical Power. One or two new power feeds from the utility company would be necessary to provide traction power to the system. This power feed would come from any of three potential PG&E substations: the existing Airport Main Substation, the Millbrae Substation, or a new substation located in the northwest of quadrant of I-380 and Highway 101 on Shaw Road. The decision regarding which substation or substations would serve BART depends on negotiations between PG&E and BART. For this document, the effects of all three substations have been analyzed.

From the I-380/Highway 101 Substation, the 34.5 kilovolt (kV) underground feeder line would go north and west along Shaw Road and Tanforan Avenue and then turn south in the SPTCo right-of-way to the traction power substation near Sylvan and Huntington Avenues. An alternative feeder route would run south on Shaw Road, then west along the southerly boundary of private properties north of I-380, continuing west on Hermosa Avenue, then north in the SPTCo right-of-way to the traction power

substation at the Tanforan Station. From the Millbrae Substation, the underground feeder line would follow the SPTCo right-of-way south to the traction power substation at the Millbrae Avenue Station. From the Airport Substation, a 34.5 kV underground feeder line would follow the north substation access road to the corner of 7th and Angus Avenues, continue west under Angus Avenue to the SPTCo right-of-way, then turn south to the traction power substation near the San Bruno CalTrain Station.

A 12 kV underground power line, located approximately 750 feet north of the Highway 101 southbound overpass into SFIA would be relocated to accommodate the footings for the BART aerial structure and the combined BART/ALRS guideway structures. BART has agreed to pay for relocating the power line to a point under Highway 101 approximately 750 feet north of its existing location. The work will be conducted by the SFIA under contract with BART.

The existing overhead PG&E power transmission lines west of Highway 101 would be raised to clear the BART aerial wye structures.

Transportation Improvements

Transit. The following major transit improvements are part of the Aerial Design Option LPA:

1) the temporary relocation of the existing San Bruno CalTrain Station during construction to a site under I-380; and
2) reorientation of SamTrans bus service.

Road Improvements. The following major road improvements are part of the Aerial Design Option LPA:

1) an extension of Hickey Boulevard to connect El Camino Real with Mission Road on the north side of the Hickey Station;
2) a new street to connect El Camino Real with Mission Road on the south side of the Hickey Station;
3) realignment and reconstruction of existing Huntington Avenue West by moving the roadway to the east immediately adjacent to Huntington Avenue East, from the intersection of Sneath Lane south to (and including) Herman/Forest Lane;
4) with the Tanforan Station, a proportionate share of improvements at the intersections of El Camino Real/Sneath, Sneath/Sears Entrances, Sneath/Huntington, and a BART station entrance/exit with Huntington;
5) extension of Hillcrest Boulevard under the CalTrain alignment and over BART, connecting El Camino Real to Aviador Avenue;
6) widening of Rollins Road, north and south of Millbrae Avenue, and widening of Millbrae Avenue, east of Rollins Road; and
7) construction of a new, one-way southbound circulation street, east of the BART/CalTrain tracks to connect the BART station and parking facilities to Adrian Road, south of Millbrae Avenue.

The City of Millbrae, with major funding assistance from the San Mateo County Transportation Authority, is constructing an overpass that separates Millbrae Avenue from the CalTrain/BART alignment. As part of the Millbrae Avenue grade separation project, California Drive is being extended to Linden Avenue.

Bike Path. Where the BART extension is built in subway, the surface right-of-way owned by BART would be made available for development of a bike path. Because the cut-and-cover right-of-way is not

contiguous, a bike path would require use of local streets and properties other than those owned by BART. The conceptual bike route identified in Figure 2.3-13 would generally follow the SPTCo right-of-way from the Colma Station tailtrack to the proposed Millbrae Avenue Station.

A number of issues must be coordinated and resolved among the local jurisdictions and agencies before a final bike path route can be defined and developed. These issues include crossing of arterials, route development on surface streets and compatibility with local traffic, compatibility with local zoning and general plans, coordination with existing bike paths and bike path plans, need for additional right-of-way, amenities, funding sources, maintenance and operations, and identification of a lead agency.

2.4 Other Alternatives Considered

The following descriptions of alternatives were those evaluated in the DEIR/SDEIS, prepared in January 1995, plus two additional non-BART alternatives. Tables 2.4-1 and 2.4-2 highlight some of the key differences among the BART build alternatives and station location options; Figure 2.4-1 illustrates the different routes and vertical alignments.

1992 LPA

This alignment was selected as the LPA following circulation of, and public comment on, the AA/DEIS/SDEIR. It is referred to in this FEIR/FEIS as the "1992 LPA" and as the "proposed project" in the DEIR/SDEIS. From the Colma BART Station, the alignment would follow the SPTCo San Bruno branch railroad right-of-way in subway through a below-grade Hickey Station in South San Francisco to South Spruce Avenue, then ascend to grade to the Tanforan Station at the Tanforan Park Shopping Center. From the Tanforan Station, the alignment would descend into a subway configuration, paralleling the north side of I-380, pass under I-380, continue in subway along the easterly limit of the City of San Bruno, then ascend to grade to reach the Airport Intermodal Station west of Highway 101. The ALRS would provide airport passenger and employee transport between the Airport Intermodal Station and the SFIA. An approximately 3,300-foot tailtrack would extend south from the Airport Intermodal Station.

I-380 Least-Cost Design Option

This design option is a variation of the 1992 LPA and differs from the 1992 LPA only in the vertical alignment through San Bruno. From the Tanforan Station, the alignment would rise on an aerial structure (as opposed to subway), curve east parallel to I-380, then turn south to descend under I-380. The alignment would continue in retained cut configuration (as opposed to subway) along the eastern city limit of San Bruno, and then ascend to ground level at the Airport Intermodal Station.

Alternative I – No Build

Defined in the AA/DEIS/DEIR as Alternative I, the No Build Alternative does not include an extension of the BART system to the vicinity of the SFIA. It consists of the following transit and transportation facilities and services: all current services of SamTrans, BART, and San Francisco Municipal Railway (Muni), CalTrain between San Francisco (4th and Townsend Streets) and San Jose; the BART extension to Colma; and regional highway improvements listed in the 1991 Transportation Improvement Program. All regional highway improvements are outside the BART–San Francisco Airport Extension study area,

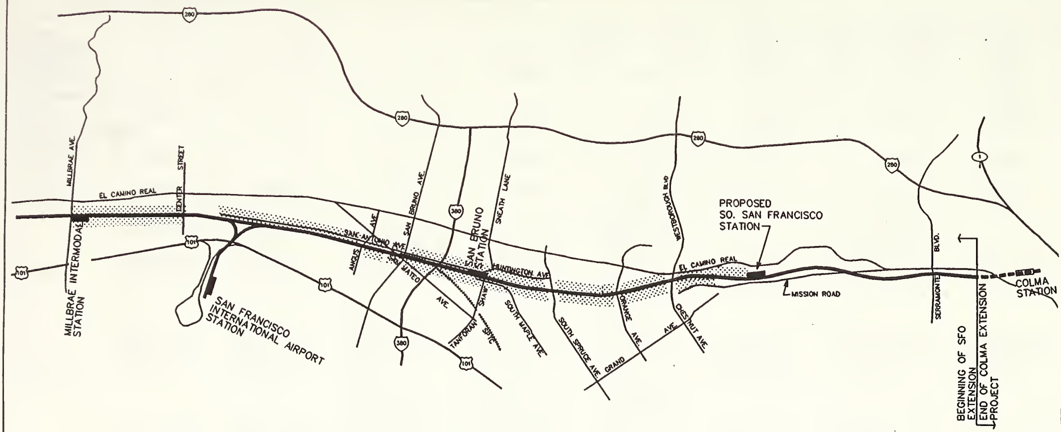

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FIGURE 2.3-13

Conceptual Bike Path

Table 2.4-1
Summary of BART Build Alternatives [1]

	1992 LPA	Alternative III Base Case Alternative	Alternative IV Airport Aerial East of Highway 101	Alternative V Minimum Length Subway to Millbrae Intermodal	Design Option V-A Minimum Length Subway to Airport GTC	Design Option V-B Minimum Length Subway to San Bruno	Alternative VI Millbrae Ave. via Airport International Terminal	Aerial Design Option LPA
Length	6.4 miles	6.1 miles	7.1 miles	6.9 miles	6.6 miles	5.7 miles	8.0 miles	8.2 miles
Number of Stations	3	3	4	3	3	2	4	4
Station Profile	• Hickey–subway • Tanforan–at grade • Airport Intermodal–at grade	• Chestnut–retained cut • Tanforan–at grade • Airport Intermodal–at grade	• Hickey–subway • Tanforan–at grade, or I-380/San Bruno–aerial • Airport Long-Term Parking–aerial • Millbrae Intermodal–at grade	• Hickey–subway • Tanforan–at grade, or I-380/ San Bruno–subway, or Downtown San Bruno–subway • Millbrae Intermodal–at grade	• Hickey–subway • I-380/San Bruno or Downtown San Bruno–subway • Airport Ground Transportation Center–subway or aerial	• Hickey–subway • I-380/San Bruno or Downtown San Bruno–subway	• Hickey–subway • Tanforan–retained cut • Airport International–subway • Millbrae Ave.–at grade	• Hickey–subway • Tanforan–subway • Airport International–aerial • Millbrae Ave.–at grade
Parking Spaces	• Hickey–1,337 • Tanforan–650 • Airport Intermodal–2,325 *Total: 4,312*	• Chestnut–1,100 • Tanforan–650 • Airport Intermodal–2,325 *Total: 4,075*	• Hickey–1,337 • Tanforan or I-380–1,500 • Airport Long-Term Parking–100 • Millbrae Intermodal–1,500 *Total: 4,437*	• Hickey–1,337 • Tanforan–1,300, I-380 or Downtown San Bruno–1,500 • Millbrae Intermodal–1,500 *Total: 4,137–4,337*	• Hickey–1,337 • I-380 or Downtown San Bruno–3,000 • Airport Ground Transportation Center–0 *Total: 4,337*	• Hickey–1,337 • I-380 or Downtown San Bruno–3,000 *Total: 4,337*	• Hickey–1,337 • Tanforan–1,000 • Airport International–0 • Millbrae Ave.–3,000 *Total: 5,337*	• Hickey–1,337 • Tanforan–1,000 • Airport International–0 • Millbrae Ave.–3,000 *Total: 5,337*
Intermodal Connections	• Airport Intermodal–CalTrain/ALRS • All Stations–SamTrans	• Airport Intermodal–CalTrain/ALRS • All Stations–SamTrans	• I-380–CalTrain • Airport Long-Term Parking–ALRS • Millbrae–CalTrain/ALRS • All Stations–SamTrans	• I-380 or Downtown San Bruno–CalTrain • Millbrae–CalTrain/ALRS • All Stations–SamTrans	• I-380 or Downtown San Bruno–CalTrain/ALRS • Airport Ground Transportation Center–ALRS • All Stations–SamTrans	• I-380 or Downtown–CalTrain/ALRS • All Stations–SamTrans	• Tanforan–CalTrain • Millbrae Ave.–CalTrain • Airport International–ALRS • All Stations–SamTrans	• Millbrae Ave.–CalTrain • Airport International–ALRS • All Stations–SamTrans
Daily Patronage Volumes (in 1998)	53,100	53,000	54,800	56,100	53,400	53,200	63,000 [2]	62,000
Capital Costs [3] (BART only–thousands 1996 $)	$1,002,370	$876,442	$1,080,325	$902,221	$1,151,893	$803,215	$1,269,234	$1,070,000
Capital Costs [3,4] (BART with ALRS–thousands 1996 $)	$1,046,370 [5]	$920,442	$1,124,325	$946,221	$1,195,893	$847,215	$1,269,234	$1,070,000
Operating and Maintenance Costs (systemwide with extension–millions 1996 $/yr)	$304.4	$304.4	$307.9	$305.4	$305.4	$301.4	$309.1	$308.2

Source: BART West Bay Extensions, 1994, 1995, 1996.

1) Other alternatives not presented here include the No Build Alternative and the Transportation Systems Management Alternative.
2) This figure has been revised from 59,500 in DEIR/SDEIS.
3) These costs exclude costs of financing and escalation.
4) Capital costs include $44,000,000 for an ALRS, which will be covered by others. The ALRS is included in all alternatives, except Alternative VI and the Aerial Design Option LPA.
5) With the I-380 Least-Cost Design Option, which includes the ALRS, capital cost would be $977,130.

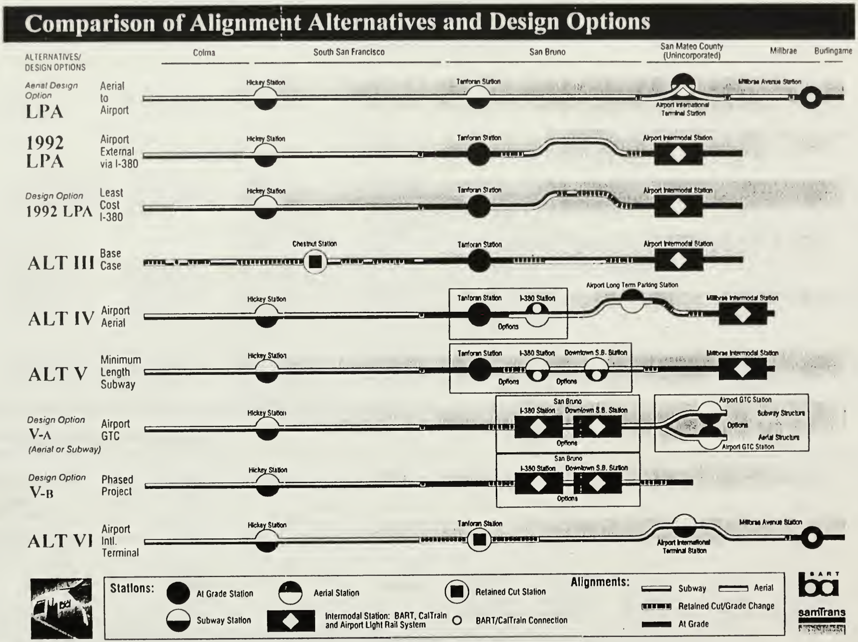
ALRS = Airport Light Rail System

Table 2.4-2
Estimated Operating and Maintenance Costs in 2010
Millions of 1996 Dollars

	1992 LPA	I-380 Least-Cost Design Option	No Build	TSM	Alternative III Base Case	Alternative IV Airport Aerial East of Highway 101	Alternative V Min. Length Subway to Millbrae	Design Option V-A Min. Length Subway to Airport GTC	Design Option V-B Min. Length Subway to San Bruno	Alternative VI Millbrae Ave. via Airport International Terminal	Aerial Design Option LPA
ANNUAL BART COSTS[1]	$304.4	$304.4	$270.6	$273.8	$304.0	$307.9	$305.4	$305.4	$301.4	$309.1	$308.2
Difference from No Build	$33.8	$33.8	—	$3.2	$33.4	$37.3	$34.8	$34.8	$30.8	$38.5	$37.6
Difference from TSM	$30.6	$30.6	($3.2)	—	$30.2	$34.1	$31.6	$31.6	$27.6	$35.3	$34.4

Source: BART West Bay Extensions, 1994, 1995, 1996.

1) Operating and maintenance costs include costs associated with the Colma, Dublin/Pleasanton, and Pittsburg/Antioch extensions.



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Comparison of Alignment Alternatives and Design Options

FIGURE 2.4-1

except those for I-280 between Highway 101 and 6th Street in San Francisco, which are assumed to be completed.

As was assumed in the Alternatives Analysis, minimum BART intervals through the Transbay Tube and between the West Oakland and Daly City Stations would be shortened during the peak commute periods from the current 3.75 minutes to 2.5 minutes. CalTrain would operate the same number of trains (60 one-way weekday trips per day between San Francisco and San Jose, with four of the trains continuing to Gilroy), and SamTrans operations would remain the same.

Alternative II – Transportation Systems Management

This alternative is identical to Alternative 2A from the AA/DEIS/DEIR. The TSM Alternative includes currently planned or funded major transportation improvements, but does not include a BART extension south of the Colma Station.

The existing San Bruno CalTrain Station would be relocated to a new site under I-380 (with approximately 170 parking spaces). The planned ALRS would be constructed by the SFIA to provide free service between the CalTrain intermodal station and all passenger terminals, the planned GTC, and other areas of the airport. A new CalTrain/ALRS/SamTrans Station would be provided west of Highway 101. Northbound and southbound freeway on- and off-ramps would connect Highway 101 with the intermodal station.

The TSM Alternative assumes roadway improvements throughout the region. Relevant improvements for the BART–San Francisco Airport Extension include Highway 101 touchdown ramps in San Francisco and I-880 in Oakland; Hickey Boulevard extension between El Camino Real and Mission Road and Hillside Boulevard; the D Street overpass/on-ramp to I-280; and turn lanes added by San Bruno to the intersections of El Camino Real with Sneath Lane and San Bruno Avenue.

CalTrain service would be expanded from 60 to 86 one-way weekday train trips between San Francisco and San Jose, with some trains continuing to Gilroy. The Muni Metro extension to Mission Bay would serve the existing CalTrain terminal at 4th and Townsend. SamTrans feeder bus service would be reoriented to serve the new Colma Station, and a shuttle bus would operate every seven minutes between the Colma Station and the SFIA terminal area.

Alternative III – BART to Airport Intermodal (Base Case)

This alternative follows the same route as the 1992 LPA from Colma to the Tanforan Station but proposes retained cut and at-grade segments (as opposed to subway) and a South San Francisco station located north of Chestnut Avenue (as opposed to Hickey Boulevard). From the Tanforan Station to the Airport Intermodal Station, the alignment would continue along the SPTCo right-of-way in an aerial structure over downtown San Bruno streets and then descend to the at-grade Airport Intermodal Station. An approximately 3,300-foot tailtrack would extend south from the station.

Alternative IV – Airport Aerial East of Highway 101

Alternative IV is identical to the 1992 LPA north of Tanforan Avenue. In San Bruno, however, the San Bruno station would be located at either Tanforan (the same as the 1992 LPA) or south of I-380 in San

Bruno's Belle Air neighborhood. South of Tanforan Avenue, the alignment would rise on an embankment to an aerial structure and curve eastward along San Bruno Avenue. The aerial structure would continue east and cross over Highway 101, then curve south to a BART station located at the airport long-term parking lot. South of the airport station, BART would parallel the I-380 viaduct before turning westward in subway under Highway 101 and rising to an at-grade Millbrae Intermodal Station at Center Street. The ALRS would transport airport passengers and employees between the BART airport station, Millbrae BART/CalTrain Intermodal Station, and the SFIA. An approximately 3,200-foot tailtrack would extend at grade south of the Millbrae Intermodal Station.

Alternative V – Minimum Length Subway to Millbrae Intermodal

This alternative is identical to the 1992 LPA north of Tanforan Avenue. The San Bruno station would be located at Tanforan, I-380/San Bruno, or downtown San Bruno. The alignment would be in subway from approximately San Bruno Avenue to Angus Avenue through downtown San Bruno. South of Angus Avenue, BART would ascend to grade, parallel to the CalTrain tracks, to a Millbrae Intermodal Station at Center Street. The ALRS would transport air passengers and airport employees between the Millbrae BART/CalTrain Intermodal Station and the SFIA. An approximately 3,800-foot tailtrack would extend at grade south of the Millbrae Intermodal Station.

Design Option V-A – Minimum Length Subway to Airport GTC

This design option is a variation of Alternative V, with BART service directly to the airport rather than to Millbrae. A San Bruno BART/CalTrain intermodal station would be located at either I-380/San Bruno or downtown San Bruno. As in Alternative V, BART would be in subway through downtown San Bruno. South of the San Bruno station, BART would be either in a subway or an aerial configuration to the airport's proposed Ground Transportation Center (GTC). The BART subway configuration would turn to the east under Highway 101, then south into the subterranean level of the GTC. The BART aerial configuration would also turn east, ascend from a subway to an aerial structure crossing over Highway 101, and then turn south to an aerial GTC Station immediately west of and perpendicular to the airport's GTC. Access to airport terminals and employment centers would be by elevator/escalator and the ALRS. An approximately 3,400-foot tailtrack would extend at grade south of the San Bruno station.

Design Option V-B – Minimum Length Subway to San Bruno

Design Option V-B is a variation of Alternative V. Under this design option, there would be no Tanforan Station but rather a San Bruno intermodal station located at either I-380/San Bruno or downtown San Bruno. As in Alternative V, BART would be in a minimum length subway through downtown San Bruno. An approximately 3,200-foot tailtrack would extend south of the San Bruno intermodal station. This design option would allow either for a future subway into the airport, or for a continuation south in the SPTCo railroad right-of-way to Millbrae.

Alternative VI – Millbrae Avenue via Airport International Terminal

Please refer to Page 2-2 under Selection of a Locally Preferred Alternative for a complete description of Alternative VI which was also evaluated.

Chapter 3
Environmental Analysis

3.0 Overview

This section presents an overview of the environmental analysis chapter, which is the focus of this Volume I and provides background information that will assist the reader in understanding the analysis. First, the organization of the chapter is described. Next, the methodology used to determine, classify, and present the environmental impacts of the project is discussed. This discussion is followed by a listing of technical reports available for public review that provide supplementary information relevant to the environmental analysis. Finally, the project location and regional setting are described, to provide a general context for the environmental setting. More detailed descriptions of existing conditions are provided in the analysis of each environmental issue.

In preparing a joint EIR/EIS, it should be noted that the requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) are not necessarily one and the same: certain requirements differ in that either the state or the federal requirement is more stringent. In addition, both CEQA and NEPA incorporate requirements which are not duplicated in the other statute. Finally, the proposed BART–San Francisco Airport Extension is subject to federal and state environmental statutes and regulations separate and apart from NEPA and CEQA. Analyses to support compliance with these statutes and regulations are also incorporated into the EIS/EIR. In any of these circumstances, the FEIR/FEIS has been prepared in compliance with the more stringent or more comprehensive requirements, whether they be federal or state.

Organization of this Chapter

This chapter is organized by environmental issue (e.g., air quality, traffic, visual quality, cultural resources, etc.). In order to assist the public in identifying particular sections of interest, a page numbering convention has been employed to distinguish sections. The pagination system identifies chapter - section - page; for example, page 3.10-2 represents Chapter 3 (Environmental Analysis), Section 3.10 (Air Quality), page 2. The impacts addressed in Sections 3.1 through 3.12 for each environmental issue are those that would occur during operation of the Aerial Design Option LPA. Impacts directly associated with construction activities are presented in Section 3.13, Construction.

For each environmental issue addressed in Sections 3.1 through 3.12, this Final Environmental Impact Report/Final Environmental Impact Statement (FEIR/FEIS) contains four areas of discussion:

- **Existing Conditions.** This section describes existing (1993) baseline conditions for each environmental issue. Baseline conditions were defined for 1993 because that was the year the Federal Transit Administration (FTA) authorized funds for further environmental documentation and when data collection efforts commenced. Existing conditions information for transportation was collected for a geographic area encompassing the San Francisco/San Mateo county line to the north, Interstate 280 (I-280) to the west, the southern city limits of San Mateo to the south, and the San Francisco Bay to the east. This area is referred to as the “study area” and generally covers northern San Mateo County, where most of the transportation impacts from the project alternatives would be experienced. A smaller geographic area, the “project corridor,” is defined

as all lands generally within one-quarter mile of the BART alignment. This area represents the area within which most localized impacts would occur, such as land use effects around stations, noise effects from transit operations, and construction activities. Finally, other impact analysis study areas are defined as necessary to address various issues or as required by legislation (e.g., the Area of Potential Effects for the cultural resource assessment).

- **Significance Criteria.** This section describes the criteria by which an impact is declared significant and therefore in need of mitigation, or actions to minimize the effects. These criteria are largely based on CEQA Guidelines, Appendix G, which generally describes circumstances when impacts would be considered significant. Where possible, the criteria are based on state or federal standards. For example, air quality significance criteria, or thresholds, are based on the state and federal ambient air quality standards; noise significance thresholds are likewise based on criteria used by the American Public Transit Association. In other cases, where the impacts may appear to be more subjective, such as for visual resources, the significance criteria are based on professional standards.

- **Impact Assessment and Mitigation Measures.** This section evaluates how the Aerial Design Option Locally Preferred Alternative (LPA) will affect the baseline conditions and classifies the impacts as "significant adverse," "insignificant," or "beneficial." This section then suggests mitigation measures to eliminate or reduce impacts that are considered significantly adverse.

- **Cumulative Impacts.** This section considers the impacts of the project in concert with the impacts of other development within the project corridor. Although the impacts of an individual project may be insignificant, the purpose of this assessment is to consider whether the project, if carried out simultaneously with other approved or proposed projects, would cumulatively have a significant effect. Two of the more important, ongoing projects include development envisioned in the San Francisco International Airport Final Draft Master Plan and the El Camino Corridor Redevelopment Plan. The former addresses future projects at the San Francisco International Airport (SFIA); the latter addresses redevelopment plans for an area in South San Francisco bounded by Hickey Boulevard to the north, Mission Road and Grand Avenue to the east, Chestnut Avenue to the south, and El Camino Real and the R. McLellan Company nursery to the west.

  The cumulative analyses for transportation, air quality, noise, and community services also consider future population growth projections in the project corridor. Projected population growth figures prepared by the Association of Bay Area Governments (ABAG) in its *Projections '94* are presented in Table 3-1. These projections consider local development plans and thus acknowledge increases in population and employment associated with projects like those at SFIA and along the El Camino corridor. Two cumulative scenarios are discussed in which the population and background development differences are notable: 1998, when the proposed project is expected to be completed, and 2010, the horizon year.

  Section 3.13, Construction, of this chapter addresses the construction-related impacts of the project for each environmental issue addressed in Sections 3.1 through 3.12. The construction section also describes the construction process to provide a basis for the subsequent discussion of impacts during the construction period. Section 3.13 contains each of the key areas of discussion described above, with the exception of existing conditions, which are not repeated.

Table 3-1
ABAG's Population Forecasts for the Project Corridor

Jurisdiction	1993	1998	2000	2010	% Increase 1993-1998	% Increase 1993-2010
Colma	1,100	1,520	1,600	1,900	28	42
South San Francisco	56,613	58,760	59,400	62,050	4	9
San Bruno	39,136	41,080	41,200	41,500	5	6
Millbrae	21,125	21,480	21,600	21,800	2	3
Burlingame	27,830	28,020	28,100	28,500	0.7	2

Source: ABAG, 1993.

Impact Assessment Methodology

Determination of Impacts

This FEIR/FEIS measures the effects of the project against the status quo, in effect the conditions that exist in the study area at the time the EIR/EIS is prepared. Accordingly, an analysis of the project in 1993 is included and assumes that the project is implemented in the baseline year (even though the actual opening year is 1998). This assessment is provided as a means to measure impacts due solely to the project without influences from general growth or other changes. With a major public project such as the proposed BART extension, several years will elapse before the project moves from the project planning stages (when an EIR is prepared) into actual operation. For this reason, the impacts of the project in 1998 (when passenger service would begin) are compared to existing conditions (1993). Where conditions would change over time, resulting in unique long-term effects, the analysis also examines impacts in 2010.

The impact assessment is based on the plans, profiles, and station layouts for the Aerial Design Option LPA that are contained in Volume IV of this FEIR/FEIS. These drawings represent a level of engineering that is beyond conceptual design but short of what would be included in bid packages for prospective contractors of the project. The drawings are, however, in sufficient detail to estimate engineering, right-of-way, and construction costs; to assess environmental impacts and recommend fairly specific mitigation measures; and to apply for necessary permits such as those required by Section 404 of the Clean Water Act for impacts to wetlands.

Classification of Impacts

To provide a clear classification of identified impacts, this FEIR/FEIS defines three types of impacts prior to the implementation of any recommended mitigation measures: significant adverse (S), insignificant (I), and beneficial (B).

- Significant impacts include adverse effects that exceed established or defined thresholds. For example, air emissions that exceed federal ambient air quality standards, or elimination of a rare or endangered species habitat, would clearly be significant adverse impacts. In some cases, it is not precisely clear whether a significant effect would occur; the analysis in these instances conservatively assesses the worst-case conditions, but the discussion acknowledges that there is uncertainty regarding the extent of the impact.
- Insignificant impacts include adverse effects that do not exceed established or defined thresholds. For example, changes in traffic congestion at an intersection from a free-flowing level of service to one where average delays may be ten seconds would be perceptible but would not represent a significant change in intersection operations. Similarly, if the wastewater service demands of the proposed project could be accommodated by the treatment plant, then the effect would be considered insignificant.
- Beneficial impacts include effects that enhance or improve an existing condition (for example, a reduction in air emissions in a nonattainment area or enhancement of a visually blighted environment).

For each impact identified as significantly adverse, the FEIR/FEIS identifies feasible mitigation measures to reduce or eliminate the negative effect. If the mitigation measures would successfully reduce the impact to an insignificant level, the FEIR/FEIS indicates so. If, however, the mitigation measures would not successfully minimize the effects to an insignificant level or if there are no feasible mitigation measures, these are classified as "unavoidable, significant" effects.

Enumeration of Impacts and Mitigations

For case of reference, each impact is numbered and prefaced by an italicized summary impact statement that highlights the classification of the impact (i.e., S, I, or B). The subsequent discussion provides an analysis of the impact and a rationale for the significance classification.

Mitigation measures are presented after impacts that are classified as significant, whenever feasible measures exist. If an impact is insignificant, mitigation measures are not required but are occasionally suggested. The measures are numbered to coincide with the impact statement they address. For example, Mitigation Measure 2.1 refers to the first mitigation for Impact 2.

Background Documentation

During the preparation of the environmental analysis in the draft documents and this FEIR/FEIS, technical reports were prepared to provide supplementary background documentation. These reports, available for review at the BART offices at 1000 Broadway in Oakland, California, include:

- Archaeological/Historical Consultants. Historical Architectural Survey Report. 1994, 1995, 1996.
- Archaeological/Historical Consultants. Historical Property Survey Report. 1995.
- Archaeological/Historical Consultants. Historical Resources Evaluation Report. 1994.

- BART SFO Extension Engineering. Capital Cost Report. 1994.
- BART SFO Extension Planning. Screening of Alternatives Report. 1993.
- BART SFO Extension Planning. BART Spot Reports. 1993.
- BART SFO Extension Planning. Public Scoping Meeting Summary Report. 1993.
- Carolyn Rice. Archaeological Survey Report. 1994.
- Carolyn Rice. Archaeological Technical Report. 1994.
- Ogden Environmental and Energy Services Co., Inc. Air Quality Technical Report. 1994.
- Ogden Environmental and Energy Services Co., Inc. Hazardous Materials Technical Report. 1994.
- Ogden Environmental and Energy Services Co., Inc. Wetland Delineation Technical Report. 1994.
- Parsons Brinckerhoff Quade & Douglas. Transportation Technical Report. 1994.

Project Location and Regional Setting

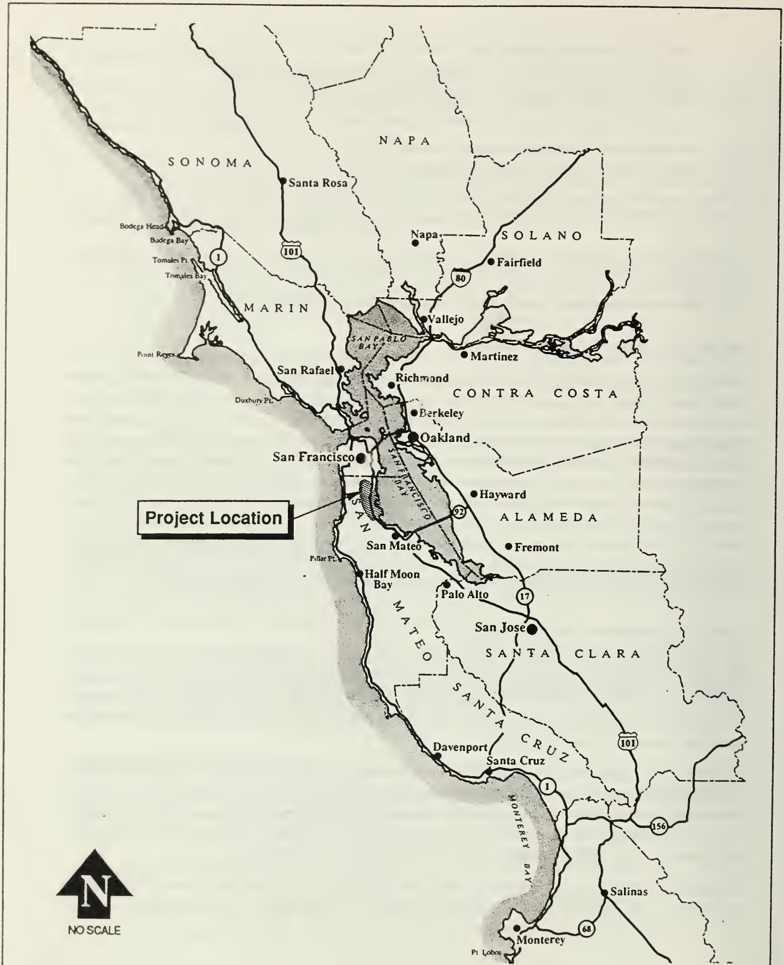
The following demographic profile and description of the regional transportation system offer a context within which to view the proposed BART–San Francisco Airport Extension. For purposes of description and analysis, this FEIR/FEIS defines both a "study area" and a "project corridor." The larger study area extends north to the San Francisco/San Mateo county line, west to Interstate 280 (I-280), east to the San Francisco Bay, and south to the southern city limits of San Mateo. A smaller geographic area, the "project corridor," encompasses lands generally within one-quarter mile of the proposed BART–San Francisco Airport Extension alignment. The project corridor, located in northern San Mateo County, is situated in the larger context of a nine-county regional area referred to as the San Francisco Bay Area (see Figure 3-1). The project corridor represents the area within which most localized impacts would occur, such as land use effects around stations, noise effects from transit operations, and construction activities. Figure 3-2 shows the study area relative to the Bay Area; Figure 3-3 shows the project corridor.

Land Use, Population and Employment

The nine counties that ring the San Francisco Bay are Marin, Sonoma, Solano, Napa, Contra Costa, Alameda, Santa Clara, San Mateo, and San Francisco. This area of 7,041 square miles, with an estimated population of 6,332,952 (State Department of Finance, 1993), makes up the fourth largest regional economy in the United States. Approximately 31 percent of the more than three million jobs in the region are devoted to service-oriented industries.

The heart of the region, centered around San Francisco and the San Francisco Bay, is urban and becomes less developed as one travels outward from the regional center. Nearly 100 incorporated cities are located in the region, ten of which support populations of over 100,000 people. San Jose, located in northern Santa Clara County, is the largest city in the region, with an estimated 1993 population of 822,000. San Francisco, with 752,000 inhabitants, is the second largest city in the region.

The project corridor is located in the West Bay portion of the San Francisco Bay Area region known as the Peninsula. The bayside area of the Peninsula contains a contiguous series of 18 suburban cities and

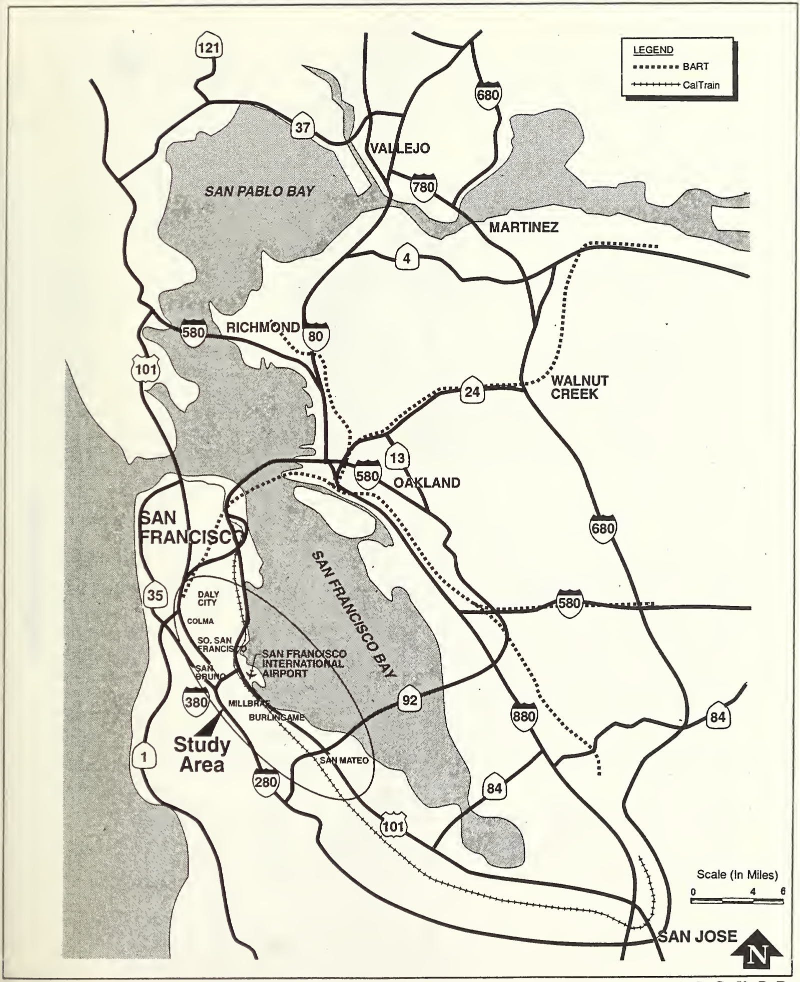


OGDEN

Regional Location

FIGURE

3-1



OGDEN

Project Study Area

FIGURE 3-2

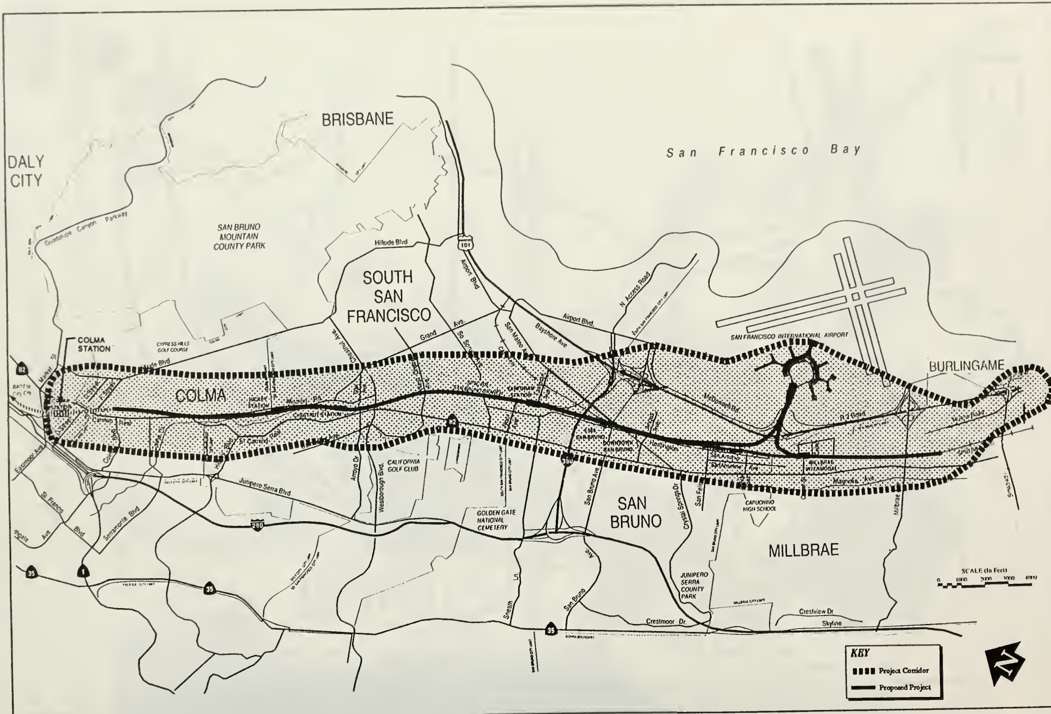


FIGURE 3-3

Project Corridor

OGDEN

towns extending from San Francisco southward to Palo Alto. Forty percent of the population in these communities commutes away from San Mateo County for work, primarily to San Francisco and Santa Clara counties. More than 50 percent of their land areas are devoted to residential uses, in contrast to 39 percent for San Francisco (San Mateo County, 1986).

Commercial uses in the bayside area of the county, which utilize about 11 percent of San Mateo County's land area, are generally concentrated in a narrow business strip that lies between El Camino Real and Highway 101. Industrial uses occupy approximately 11 percent of the county land area and are generally located in industrial parks. Economic trends in northern San Mateo County indicate a decline in the manufacturing sector and a strengthening of the service, retail, and wholesale trade sectors.

Figure 3-2 shows the region and details the main components of the regional transportation network: the major highways, the San Francisco Bay crossings, the BART system, and the Peninsula Commute Service (CalTrain).

The project corridor, measuring approximately eight miles long, has a northern terminus that lies in the unincorporated Colma area, a small urban neighborhood located between Daly City and the Town of Colma. The corridor extends south through Colma, South San Francisco, San Bruno, a small portion of unincorporated San Mateo County owned by the San Francisco International Airport (SFIA), Millbrae, and the northern portion of Burlingame (see Figure 3-3). More specific information regarding the land use, population, and economy of the project corridor can be found in this document under Section 3.2, Land Use.

Transportation

Regional Road Network

The San Francisco Peninsula has two major parallel north-south freeways serving the study area: Highway 101 and I-280. North of the study area, the two freeways intersect in San Francisco; Highway 101 continues north and connects directly with I-80, which serves the San Francisco downtown area and connects with the East Bay via the Bay Bridge. In the study area, I-380 connects Highway 101 and I-280 just north of the SFIA. South of the study area, State Route 92 also links the two freeways and crosses over San Francisco Bay via the San Mateo–Hayward Bridge. Other regional north-south roads near the study area are Route 1, which runs along the Pacific Ocean side of the Peninsula, and Route 35 (Skyline Boulevard), which runs along the Coast Range ridge in the center of the Peninsula.

In addition to the regional freeways, there are a number of major north-south arterial streets in the area (see Figure 3-3):

- El Camino Real (Route 82) is the major arterial between Daly City and San Jose. El Camino Real is the only continuous street serving the entire length of the Peninsula; all other north-south streets serve only portions of the project corridor. In San Bruno, El Camino Real serves the Tanforan Park and Towne Center shopping centers and has a freeway interchange with I-380.

- Old Bayshore Highway in Burlingame, McDonnell Road in the SFIA, Airport Boulevard in South San Francisco, and Bayshore Boulevard in Brisbane and Daly City form a continuous frontage road along the east side of Highway 101. The frontage road serves airport-oriented aviation and commercial activities on the east side of Highway 101. The frontage road crosses under

Highway 101 at the Airport Boulevard interchange and serves downtown South San Francisco, located west of Highway 101.

- Parallel to I-280, Junipero Serra Boulevard extends north from Avalon Drive in South San Francisco to San Francisco. This road serves residential neighborhoods in South San Francisco, commercial activity in Colma and Daly City, and the Colma BART Station.

- North of San Bruno Avenue, two-lane San Mateo Avenue serves the light industrial areas of San Bruno and South San Francisco. South of San Bruno Avenue, San Mateo Avenue serves downtown San Bruno.

- Huntington Avenue runs parallel to the Southern Pacific Transportation Company (SPTCo) alignment and serves both downtown San Bruno and the Tanforan Shopping Center area.

Major east-west arterial streets in the study area are noted below:

- San Bruno Avenue has east-west interchanges with both Highway 101 and I-280 and serves the Bayhill neighborhood of San Bruno.

- Chestnut Avenue/Westborough Boulevard in South San Francisco and Sneath Lane in San Bruno both have interchanges with I-280. Sneath Lane also serves the Tanforan Shopping Center and the Towne Center.

- Millbrae Avenue in Millbrae has an interchange with Highway 101 and connects to residential areas to the east with El Camino Real, the CalTrain station and Highway 101.

Transit

Four major public transit operators provide service within or adjacent to the study area:

- Bay Area Rapid Transit District (BART),
- Peninsula Commute Service (CalTrain),
- San Mateo County Transit District (SamTrans), and
- San Francisco Municipal Railway (Muni).

Existing services provided by each of these operators are briefly described below; more detailed information on transit service can be found in Section 3.1, Transportation, of this document.

BART. The existing BART system provides rapid rail service between East Bay locations to San Francisco and beyond to Daly City. An extension to Colma was completed in the winter of 1996. The system, with a hub in downtown Oakland, includes 75.3 miles of track and 36 stations in a basic "X" formation. Three of the four lines—Richmond, Concord and Fremont—provide direct service to San Francisco from the East Bay. The remaining line travels between Richmond and Fremont. Daily ridership on the BART system averaged 248,200 passengers per weekday during the first six months of 1995.

Weekday service is provided from 4:00 A.M. to 1:30 A.M. in the East Bay, with service hours in the West Bay from 5:04 A.M. to 1:28 A.M. BART fares are distance-based, with a minimum fare of $1.00 and a maximum of $4.00. High-value tickets can be purchased at a small discount, and purchase of a Muni Fast

Pass entitles passengers to ride BART within the City of San Francisco at no additional cost. Other joint fares are available with the BART Plus and Trans Link passes.

CalTrain. CalTrain is a commuter rail service operating north and south along the Peninsula between the San Francisco terminus station (at 4th and Townsend Streets) and Gilroy 30 miles south of San Jose. Four of the 60 A.M. and P.M. peak-hour trains originate or end in Gilroy; the remainder originate or terminate in San Jose. The line from San Francisco to Gilroy is approximately 77 miles and serves 33 stations. Sixty trips (30 northbound and 30 southbound) are operated each weekday. During the peak commute period in the peak direction, many trains operate as limited-stop or express service. Otherwise, all trains serve nearly all stations. Daily ridership in 1996 averages 22,400 passengers.

Service is provided between 4:49 A.M. and 11:52 P.M. on weekdays, and from 6:24 A.M. to 11:34 P.M. on Saturdays, Sundays, and holidays. CalTrain uses a zone fare structure, with six zones existing between San Francisco and San Jose. Two additional zones extend from San Jose to Gilroy. The minimum regular one-way fare is $1.00 (for travel within a single zone) and the maximum is $5.50 (for one-way travel through all eight zones). Monthly passes can be purchased for between $22.00 and $145.75. Discount passes, weekend passes, 20-ride punch cards, and single-day round trip tickets are also available. Round trip tickets are available at a discount.

SamTrans. SamTrans operates with fixed-route and paratransit bus service in San Mateo County. Eighty routes operated countywide each weekday, carrying approximately 66,000 passengers in 1995. Service is oriented around a number of high-volume, north-south trunkline routes, and numerous local, community-based routes which feed the trunkline services as well as CalTrain stations and the Daly City and Hayward BART Stations. Frequency of service varies by route and time of day, with more frequent service provided on most routes during the A.M. and P.M. peak hours.

The base fare is $1.00; express service to San Francisco ranges up to $2.50, comparable to CalTrain fares. Monthly passes are available and free transfers are allowed between CalTrain and connecting SamTrans feeder buses.

Muni. Muni operates fixed-route bus (diesel and electric trolley), cable car, and light rail transit services within the City and County of San Francisco. A total of 81 routes, including five light rail (Metro) lines, operate each weekday, with the majority oriented towards downtown. Daily ridership on Muni was about 680,000 in 1995. As with SamTrans, frequency of service varies by route and time of day. Some limited "owl" (24-hour) service is provided.

Fares on Muni are priced at $1.00 per ride for an adult, with a monthly unlimited-use Fast Pass available for $35.00. Reduced rates are available for the elderly, disabled, and youth. The basic fare must be paid by passengers transferring from CalTrain unless a Peninsula Pass sticker is purchased along with a CalTrain Monthly Pass. The Peninsula Pass is good on all Muni bus and Metro lines. The Muni Fast Pass can be used on both BART and CalTrain within the boundaries of the City and County of San Francisco.

Section 1
Transportation

1.1 Introduction

This section describes existing, or baseline (1993), facilities, conditions, and travel patterns in the BART–San Francisco Airport Extension study area. The study area for the transportation impacts analysis consists of northern and mid-San Mateo County. This area is generally defined by the City of San Mateo's southern city limits in the south, I-280 to the west, the San Francisco-San Mateo county line to the north, and the San Francisco Bay to the east. This area is larger than and encompasses the project corridor, the area within which most localized effects would occur. The year 1993 was chosen as the baseline year for existing conditions, because that was the year the FTA authorized funds for further environmental documentation and when data collection efforts commenced. These 1993 existing conditions define the No Build Alternative and are used as a baseline for determining the impacts of the project. Analysis of 1993 as the baseline year in this FEIR/FEIS was necessary to maintain consistency with the analysis in the DEIR/SDEIS and the FRDEIR/S#2DEIS. Travel patterns under the No Build Alternative are also projected for 1998 and 2010 to provide a base condition in future years for comparison without the project.

This section addresses the transportation-related impacts of the Aerial Design Option LPA that would occur during operation of the BART extension. Impacts directly associated with construction activities are presented later in Section 3.13, Construction.

1.2 Existing Conditions

Transportation in the study area has many components and the following section presents an overview of these components. Service to the San Francisco International Airport is one of the central objectives of the BART–San Francisco Airport Extension. This section begins with a summary of airport travel demand, transportation services to the airport, and programmed transportation improvements at the airport. Following this material on the airport are summaries of the transit operators in the study area, BART, CalTrain, SamTrans and Muni. A brief overview of the regional roadways is then presented to orient the reader to the roadway network in the study area. In addition to providing a context for discussing transit and traffic impacts, this section also summarizes current conditions on parking, pedestrian circulation, bicycle lanes, and railroad freight services.

San Francisco International Airport (SFIA)

The SFIA is the seventh busiest airport in the world, serving 29.9 million annual airline passengers in 1990. It is the second largest employment center in the Bay Area, and the largest employment center in San Mateo County, with approximately 33,400 employees in 1990. These factors make the SFIA a primary travel generator within the study area.

Airport Travel Demand. Growth projections included in the *San Francisco International Airport Final Draft Master Plan Final Environmental Impact Report* (SFIA Master Plan FEIR) show that annual airline passengers are predicted to increase from about 29.9 to 51.3 million by 2006. Associated with this

increase would be an employment increase from 33,400 to 42,400 by 2006. These growth rates are substantially greater than those for the study area in general, indicating that travel to or from the SFIA will play an increasingly significant role in travel patterns in the future. About two-thirds of the airline passengers originate in San Francisco and northern San Mateo counties; the rest are distributed around the entire region.

Airport employees, on the other hand, reside mostly in San Mateo County, with significant numbers also residing in the three closest counties, San Francisco, Alameda, and Santa Clara. Fifty-six percent live south of the SFIA.

The majority of airline passengers rely on automobiles (65.7 percent), although a significant number use scheduled and on-call transit (26.3 percent). Employees also rely heavily on the automobile (68.0 percent), perhaps because of the large supply of free employee parking, but a significant number use carpools/vanpools (20.0 percent), as shown in Table 3.1-1.

Table 3.1-1
SFIA Airline Passenger and Employee Access Modes
Percent Distribution

Access Mode	Airline Passengers	Employees
Rental Car	19.6%	0.0%
Private Car	46.1	68.0
Carpool	0.0	13.0
Vanpool	0.0	7.0
Scheduled Transit	3.3	3.6
On-Call Transit*	23.0	1.5
Taxi	6.1	0.0
Charter Bus	1.2	5.0
Walk/Bicycle/Other	0.7	1.9
TOTAL	100.0%	100.0%

Sources: MTC, "MTC Air Passenger Survey, 1990" September 1991;
SFIA, "1991 Airport Employee Link Travel Survey" July 1992.

* Includes on-call van services, "Airporter" express buses, hotel/motel courtesy vans, and luxury limousines.

Transportation Services to the SFIA. A variety of transportation services currently provide access to the SFIA. The primary highway access is via Highway 101, with direct connections from I-280 via I-380. The SFIA has a total of 25,559 parking spaces, 10,345 for short- and long-term airline passengers, 2,280 for rental cars and taxis, plus 12,934 for employees. An additional 5,170 long-term parking spaces are provided by privately operated facilities that are not on SFIA property. One public and 18 private bus carriers also provide service to the SFIA. The public carrier, the San Mateo County Transit District (SamTrans), provides four bus routes including express and local connections to SFIA terminals from downtown San Francisco, the Daly City BART Station, the Millbrae CalTrain Station, and San Mateo

County. The 18 private bus carriers provide connections from a variety of locations, including points as far away as Sacramento.

Programmed Airport Transportation Improvements. The SFIA Master Plan outlines a number of infrastructure improvements that will affect access to SFIA terminals and employment areas. The key improvements are the construction of a new International Terminal, new Ground Transportation Center (GTC), an Airport Light Rail System (ALRS), additional parking, and improvements to internal roadways. The ALRS, in particular, is important because it would provide frequent shuttle service between a proposed transit station (either the Peninsula Commute Service [CalTrain] and/or BART service) and the terminals and employment centers at SFIA. Discussions are ongoing with the SFIA to coordinate completion of SFIA improvements consistent with BART construction scheduling, thereby achieving economies of scale and construction efficiencies. A memorandum of understanding between the SFIA and BART is being developed to define the responsibilities of each party should the BART project be implemented.

The SFIA Master Plan proposes to increase airport parking from the current 25,559 spaces to 32,642 spaces by 2006, a 27.7 percent increase. Employee parking would increase by 21.1 percent, airline passenger parking (both long- and short-term) would increase by 49.7 percent, while rental car and taxi spaces would decrease by 34.8 percent. The SFIA Master Plan FEIR, however, projects a shortage of 4,391 passenger-serving, public spaces in 2006.

Public Transit

Four major public transit operators provide service within or adjacent to the project study area: BART, CalTrain, SamTrans, and the San Francisco Municipal Railway (Muni). Existing services provided by each of these operators are described below.

BART. The BART system provides rail transit service between East Bay locations and San Francisco. Current daily ridership on the BART system is approximately 248,200 (through the first six months of 1995), with nearly half of these riders traveling between the East and West Bays. The East Bay is defined as Alameda and Contra Costa counties; the West Bay includes San Francisco and San Mateo counties. Another 68,600 daily riders use BART solely for intra-West Bay travel. Downtown San Francisco stations are the busiest in the system, with about 87,000 daily boardings at the four stations from Embarcadero to Civic Center. The Daly City Station in San Mateo County was the busiest in the system outside of downtown San Francisco, experiencing over 24,000 daily boardings and alightings in 1993. Almost 80 percent of these Daly City Station riders were San Mateo County residents. An extension of BART 1.5 miles southward from the Daly City Station to a new station immediately north of the Town of Colma was completed and began revenue service in February 1996.

CalTrain. CalTrain is a commuter rail service operating along the San Francisco Peninsula primarily between San Francisco and San Jose, but also south to Gilroy on a more limited basis. The San Francisco terminus station is located at the intersection of 4th and Townsend Streets. Daily ridership in 1996 averages 22,400, with about 59 percent of this ridership destined for the San Francisco terminus station. About 13 percent of CalTrain ridership originates within the BART extension transportation study area, or project corridor. Peak-period load factors average about 0.71 passengers per seat. Sixty trips operate each weekday, 30 northbound and 30 southbound. Most trains operate as limited-stop or express service during the peak commute period in the peak direction. All other trains serve nearly all 34 stations along the 77-mile route.

The Metropolitan Transportation Commission (MTC) Regional Rail Extensions Program (MTC Resolution No. 1876) includes an extension of CalTrain from its current San Francisco terminus at 4th and Townsend to the downtown area. Options for this extension were the subject of a separate MTC study, the *CalTrain San Francisco Downtown Extension/System Upgrade Final Report* (March 1994).

SamTrans. SamTrans operates fixed-route bus services in San Mateo County. Eighty routes are operated countywide each weekday, carrying approximately 66,000 daily passengers in 1995. Service is oriented around high-volume, north-south trunkline routes and numerous local, community-based routes. Local routes feed the trunkline services as well as CalTrain and BART stations.

The 14 routes serving downtown San Francisco carry approximately 23,800 daily passengers. Of these passengers, about 38 percent originate in, or are destined for, San Francisco. The remaining 62 percent are traveling between points in San Mateo County. Local routes carry another 10,200 passengers who transfer between SamTrans and BART at the existing Daly City Station and continue to San Francisco or the East Bay. The number of SamTrans-to-CalTrain transfers is about 300 per day, approximately 1.5 percent of total CalTrain ridership.

SamTrans also provides direct local and express bus service to the SFIA. Recently, dedicated bus shuttles were added between the Colma BART and Millbrae CalTrain Stations to SFIA, funded in part by the Bay Area Air Quality Management District and the SFIA.

Muni. Muni transit services provide connections from outside the project study area to public transit providers inside the study area, including BART, CalTrain, and SamTrans. Muni operates fixed-route bus (diesel and electric trolley), cable car, and light rail transit services within the City and County of San Francisco. Seventy-nine routes, including five light rail (Metro) lines, operate each weekday, with the majority of these oriented towards downtown. Daily ridership on Muni is about 680,000 boardings in 1995.

Regional Roadways

Freeways. The San Francisco Peninsula has two major parallel north-south freeways, Highway 101 in the east and I-280 in the west. North of the study area within the City of San Francisco, the two freeways intersect. Highway 101 continues north to serve downtown San Francisco and the East Bay via its connection with I-80, and I-280 also continues north and terminates at the Embarcadero. I-280 is now being connected to a new surface King Street/Embarcadero roadway system replacing the demolished Embarcadero Freeway. In the project corridor, connections between the freeways can be made using I-380 just north of the SFIA. South of the project corridor, State Route 92 connects the two freeways as well as crosses the San Francisco Bay via the San Mateo-Hayward Bridge.

Sections of the study area's roadways are significantly congested during peak commute periods. Since the Loma Prieta earthquake in 1989, peak-period congestion increased on most of the regional roadways, and in particular on Highway 101 north of Third Street in San Francisco, due to the closure of I-280 north of its junction with Highway 101. However, the I-280 interchange was re-opened in 1995. In the transportation study area, motorists using Highway 101 encounter long delays between State Route 92 in the south and Millbrae Avenue in the north.

Transportation Study Area Streets and Roads. In addition to the regional freeways described, there are a number of major north-south arterial streets in the study area. El Camino Real (Route 82) is the

only continuous arterial street serving the entire length of the Peninsula from Daly City to San Jose. In San Bruno, El Camino Real serves the Tanforan Park Shopping Center and the Towne Center and has a freeway interchange with I-380. The intersections of El Camino Real with Sneath Lane in San Bruno and with Millbrae Avenue in Millbrae are both heavily congested.

Old Bayshore Highway in Burlingame, McDonnell Road at the SFIA, Airport Boulevard in South San Francisco, and Bayshore Boulevard in Brisbane and Daly City form a continuous frontage road along Highway 101. The frontage road serves aviation and airport-oriented commercial activities on the east side of Highway 101. This road crosses under Highway 101 at the Airport Boulevard interchange and serves downtown South San Francisco, located west of Highway 101.

Parallel to I-280, Junipero Serra Boulevard extends from Avalon Drive in South San Francisco northward to San Francisco. This road serves residential neighborhoods in South San Francisco, commercial activity in Colma and Daly City, and the Colma BART Station. North of San Bruno Avenue, the two-lane San Mateo Avenue serves the light industrial areas of San Bruno and South San Francisco. South of San Bruno Avenue, San Mateo Avenue serves downtown San Bruno. Huntington Avenue runs parallel to the SPTCo/CalTrain alignment and serves both downtown San Bruno and the Tanforan Park Shopping Center area. The eastern part of its right-of-way is owned by the City and County of San Francisco and is part of an old, interurban light rail right-of-way. Huntington and San Mateo Avenues are among the few streets to cross under I-380.

There are several major east-west arterial streets in the study area. San Bruno Avenue has east-west interchanges with both Highway 101 and I-280. It is a relatively narrow, four-lane road, with little room for widening without acquiring property. Other east-west arterials in the study area are Chestnut Avenue/Westborough Boulevard and Sneath Lane. Both roadways provide interchanges with I-280. Sneath Lane also serves the Tanforan Park Shopping Center and the Towne Center.

As part of the DEIR/SDEIS and the FRDEIR/S#2DEIS, approximately 97 intersections in the study area were analyzed in the three analysis years. The level of service for the existing intersections in 1993 can be found in Table C-1, Intersection Level of Service Year, in Appendix C of the DEIR/Technical Appendix.

Proposed Roadway Improvements. A number of transportation improvements are planned for the study area that are independent of the BART extension. These improvements are subject to the availability of funding. In 1988, the voters of San Mateo County approved a sales tax increase (Measure A) to fund a 20-year program consisting of roadway and transit improvements. The key roadway components of the plan located in or adjacent to the study area include: 1) repair Highway 101 touchdown ramps in San Francisco, and I-880 (the Cypress Freeway) in Oakland, 2) extend Hickey Boulevard to connect El Camino Real with Mission Road and Hillside Boulevard, 3) improve egress from the new Colma BART Station with D Street overpass/on-ramp to I-280, and 4) add turn lanes to the intersections of El Camino Real with Sneath and San Bruno Avenues.

Parking

Public parking is generally free at existing BART stations, and nominal fees are charged at CalTrain stations. CalTrain currently charges $0.50 per day (or $4.00 per month for monthly pass or 20-ride pass users) for parking spaces at the San Bruno CalTrain Station as well as at all other CalTrain stations on the Peninsula. Several proposed BART station sites have adjacent activity centers with significant parking

demand: Tanforan Park Shopping Center and Towne Center near the Tanforan Station site and the major activity centers in downtown San Bruno, such as Artichoke Joe's near the existing CalTrain station. Much of the CalTrain and Artichoke Joe's parking is on property proposed either for construction easements or acquisition. This property is currently leased from the City and County of San Francisco Water Department, which owns a 25- to 50-foot strip of property (an old, interurban car right-of-way) on the west side of the Peninsula Corridor Joint Powers Board (JPB) CalTrain right-of-way. Parking conditions at the SFIA are described above under the heading "Transportation Services to the SFIA."

Pedestrian Circulation

Pedestrians circulate throughout the study area by way of sidewalks on neighborhood streets and on pedestrian paths. This discussion concentrates on circulation across the project corridor and focuses on those patterns with substantial pedestrian volumes which would be most likely to be affected by the BART extension. Common, informal pedestrian crossings within the project corridor are identified below. (It should be noted that crossing the railroad right-of-way is considered trespassing, is unlawful, and can be dangerous.)

- In Colma, pedestrians cross the SPTCo right-of-way to access neighborhoods, cemeteries, and commercial centers.
- In South San Francisco, residents from the neighborhoods cross the SPTCo right-of-way to access activity centers in the area, such as Kaiser Permanente Medical Center and Tanforan Park Shopping Center. Students at South San Francisco High School and El Camino High School use the SPTCo right-of-way to reach the schools.
- In and around downtown San Bruno, residents in neighborhoods to the east of the SPTCo/CalTrain right-of-way, such as the Belle Air neighborhood, currently have unrestricted access across the right-of-way to downtown San Bruno, and residents to the west of Huntington Avenue and the SPTCo/CalTrain right-of-way have access to activity centers such as Belle Air Elementary School and Lion's Field Park.

Bicycle Lanes, Routes and Paths

In San Mateo County, responsibility for planning and providing bicycle facilities rests with the county, local cities, and Caltrans. Many cities in the county have developed their own bicycle systems to varying degrees. The county includes bikeways in many of its road widenings in unincorporated areas. The bikeway plans for the cities generally reflect the information found in the San Mateo County General Plan. Existing bicycle facilities in the project corridor are:

- Along Junipero Serra Boulevard from Sneath Lane in San Bruno to Daly City.
- Along Hillside Boulevard, Chestnut Avenue, and Westborough Boulevard in South San Francisco.
- Along Millbrae Avenue, El Camino Real, Skyline Boulevard, and the SPTCo right-of-way, adjacent to the railroad tracks, in Millbrae.
- Along the frontage road of Highway 101 in Burlingame, and on Old Bayshore Highway, McDonnell Road in SFIA, Airport Boulevard in South San Francisco, and Bayshore Boulevard in Brisbane.
- Along Huntington Avenue from south of Sneath Lane crossing the San Bruno/South San Francisco city limits to Spruce Avenue, and then again along Mission Road between Chestnut Avenue and extension of Hickey Boulevard.

The following are planned bikeways in the project corridor:

- The Park-Recreation-Open Space Element of the South San Francisco General Plan suggests a modification to the Bicycle Element of the city's general plan in keeping with the linear park proposals. The bicycle-recreation path would run along the SPTCo right-of-way from the San Bruno/South San Francisco city limit to just south of Westborough Boulevard, where it would jog over and run along Colma Creek in a linear park north to Hickey Boulevard. At Hickey, the path would jog to meet another bicycle path, suggested in the plan, running north-south in the right-of-way owned by the City and County of San Francisco Water Department.
- The San Bruno General Plan recommends development of a bicycle path in the SPTCo/CalTrain right-of-way, adjacent to the railroad tracks, primarily for recreational purposes. A bicycle path is planned along the right-of-way from the Millbrae city line, along the proposed BART alignment, to Hickey Boulevard, where a bicycle route would connect to Junipero Serra Boulevard.
- The Millbrae General Plan suggests that the bikeway system could include a bike path on the western end of Millbrae for recreational use as well as provide an important link between Skyline Boulevard and the El Camino/Old Bayshore routes.

The general plans of South San Francisco, San Bruno, and Millbrae indicate a planned bikeway along the railroad right-of-way the length of the project corridor.

Railroad Freight Service

In the cities of South San Francisco, San Bruno, Millbrae, and Burlingame, freight service currently exists along the CalTrain mainline. The SPTCo San Bruno branch right-of-way parallels El Camino Real between Colma and San Bruno, and is the proposed BART right-of-way for the extension to the SFIA. Over the past several years, there was only minimal freight service (about four freight cars per month) along this branch, serving customers such as the Macy's warehouse, located north of Chestnut Avenue in South San Francisco. Recently, SPTCo has abandoned freight service on this branch.

1.3 Transit Impact Assessment and Mitigation

Significance Criteria and Methodology

The extent to which the proposed project affects mass transit service and ridership is best understood through a discussion of the following: 1) the nature of travel demands in the region and the corridor; 2) the degree to which transit travel times between various locations improves; 3) the number of added transit travelers; 4) the mode choice shift toward mass transit; and 5) the total volume of riders that would use the new transit facilities. Negative transit impacts are considered significant if:

- existing transit services are precluded from operating;
- the quality or reliability of the service is degraded to the point where reduced mobility occurs; or
- project-created demand for use of major, fixed transportation facilities exceeds capacities of those facilities.

The transportation impact analysis is based on the MTC travel demand forecasts for 1990 and 2010. The MTC forecasts provide both transit ridership (including BART) and highway travel for the region, study area, and project corridor. The 1993 and 1998 data presented in this document were estimated from the 1990 and 2010 forecasts. The data on transit ridership are derived from the MTC modeling process,

which is the methodology required by FTA. FTA requires use of the Metropolitan Planning Organization (MPO) forecasts; MTC is the MPO for the San Francisco Bay region. The MTC model is a regional model, meaning that the traffic analysis zones, or geographic units to/from which trips are assigned, are relatively gross. For example, because multiple zones have not been created for the SFIA, the model is insensitive to access trade-offs that affect specific SFIA station locations and walk versus ALRS ride times. Therefore, while the model can provide useful results, individual statistics such as boardings or transfers at each station location (especially on the SFIA premises) should be considered approximations. More importantly, the travel modeling process used for the analysis, like other such methodologies conventionally accepted and used for performing regional planning and corridor studies for federal review, principally reflects relative travel time differences computed along the fastest route. The travel modeling process is not responsive to factors such as the reliability of service, transit vehicle capacities, nor to other subjective factors such as the location of the transfer point, which may significantly affect actual patronage in a "real world" case. It should also be noted that the travel model adds a "penalty" to walking time and transfer time, both of which are treated as "out of vehicle" time.

The patronage information that has been generated is adequate for assessing significant adverse impacts of the Aerial Design Option LPA. At the same time, because of the limitations of the methodology, the patronage should be considered a general indicator of the ridership that may occur. BART entries and exits by type of trip and year are presented in Appendix B of this document.

The BART extension affects both CalTrain and SamTrans, the other transit operators in the study area. CalTrain would experience increased ridership due to the new direct link with BART. Increases in CalTrain service are included in the MTC modeling process as probable occurrences, with or without assumptions of improvements to BART service. These would be implemented by the JPB during the planning period.

SamTrans should not be adversely affected by the BART extension. Discussions with SamTrans indicate that extensive feeder bus service would be established to the new BART stations but that a commensurate reduction in express service from San Mateo County to downtown San Francisco would likely occur. The MTC modeling process reflects these changes, and data presented in the following discussion include these assumptions.

Project-Specific Analysis

1. *The Aerial Design Option LPA would increase peak mass transit vehicle requirements and mileage for BART, CalTrain, and SamTrans. (I)*

   Changes in transit services associated with the Aerial Design Option LPA are shown in Table 3.1-2, which presents the estimated vehicle requirements and service miles operated for relevant transit operators. Service increases would in turn increase vehicle requirements and miles of service. The values shown in Table 3.1-2 apply to 1998 and 2010, since the transit service levels were held constant in the model.

   Peak vehicle requirements for BART would increase by 43 cars, and the total vehicle fleet would increase by 49, compared to the 1993 No Build Alternative. Forty cars are required during the peak period for the Aerial Design Option LPA to extend the two lines south of Colma. Maintenance considerations bring the overall requirement to 46 new vehicles, in order to have 40 cars in service

Table 3.1-2
Locally Preferred Alternative
Transit Operator Service Characteristics

	Projected Operations	Change from No Build
BART		
Peak Vehicle Requirements	535	43
Fleet Vehicle Requirements	674	49
Annual Vehicle Miles Operated (millions)	57.8	5.2
CalTrain		
Peak Vehicle Requirements		
Locomotives	21	7
Passenger Cars	74	22
Fleet Vehicle Requirements		
Locomotives	24	4
Passenger Cars	85	12
Annual Train Miles Operated (millions)	1.36	0.64
SamTrans		
Peak Vehicle Requirements	293	3
Fleet Vehicle Requirements	338	4
Annual Vehicle Miles Operated (millions)	9.02	0.09

Sources: BART, May 1994.
Parsons Brinckerhoff, December 1993.
Manuel Padron & Associates, Final O&M Cost Estimates, AA/DEIS/DEIR, March 1992.

daily. Three more cars are required for the shuttle between the Airport International Terminal Station and the Millbrae Avenue Station. Annual vehicle miles would also increase by about 5.2 million.

A fleet maintenance program designed to reduce the number of existing BART cars awaiting parts is being implemented, and is expected to make 10 cars available for the BART extension. The construction of additional maintenance pits at the Concord and Hayward shops will make another 12 cars available from the existing fleet. The combination of the 22 car increase in useful fleet and the purchase of 28 new cars will cover the BART extension operating requirement.

CalTrain vehicle requirements and miles operated would increase, as shown in Table 3.1-2. SamTrans operations would increase marginally under the Aerial Design Option LPA because of the need for feeder bus services to the new BART stations. The increase in SamTrans operations would not constitute a significant impact in terms of cost or operational issues.

2. *Transit travel times would improve for most transit users traveling between points in northern San Mateo County and San Francisco or the East Bay. For other transit users, travel times would stay the same, or in some cases, increase by a small amount. (B)*

Table 3.1-3 shows transit travel times between selected origins and destinations. The travel times presented in Table 3.1-3 are for the A.M. peak hour to reflect congested conditions when the largest percentage of transit trips are made. Compared to the No Build Alternative, transit travel times would generally be less. For 46 of 49 origin/destination pairs in the table, transit travel times would improve or remain unchanged. Some locations would experience minor increases (two minutes or less) in travel times, as a result of reduced bus service on SamTrans routes that duplicate service offered by the BART extension. These cases, however, are few, and the overall impact of the Aerial Design Option LPA would be beneficial.

3. *Transit boardings on BART and CalTrain would increase, but boardings on SamTrans would decrease compared to the No Build Alternative. (B)*

Table 3.1-4 shows the daily transit boardings for BART, CalTrain, the ALRS, and SamTrans under the Aerial Design Option LPA. As indicated, BART and CalTrain would experience increased boardings, while SamTrans boardings would decrease because the proposed rail improvements would attract patrons who formerly rode the bus. The MTC Regional Rail Transit Extensions Program (MTC Resolution No. 1876) includes an extension of CalTrain from its current San Francisco terminus at 4th and Townsend Streets to the central downtown area. The JPB, the entity owning CalTrain, is currently (1996) preparing a DEIS/DEIR for this extension. The patronage forecasts for the BART extension build alternatives with and without the CalTrain downtown extension were presented in the *Alternatives Analysis/Draft Environmental Impact Statement/Draft Environmental Impact Report* (AA/DEIS/DEIR), published by MTC in 1992. The assumptions used by the MTC in the travel demand modeling for the BART extension with and without the CalTrain downtown extension were held constant for the analysis of the BART extension in this FEIR/FEIS.

Estimates of transit boardings on BART and CalTrain, with the proposed CalTrain downtown extension, are based on the patronage forecasts for Alternatives 3A and 3B, from the AA/DEIS/DEIR. Alternative 3A is a BART build alternative (the Base Case Alternative in the DEIR/SDEIS) without the proposed CalTrain extension to downtown San Francisco, whereas Alternative 3B is the Base Case Alternative plus the CalTrain downtown extension.

In the following discussion, BART boardings without the CalTrain downtown extension are compared to boardings with the CalTrain extension. BART boardings of 399,500 under Alternative 3A (without the CalTrain extension) decline by 4 percent, to 383,700, under Alternative 3B (with the extension). Assuming a similar relationship for the Aerial Design Option LPA, BART boardings would also decline by 4 percent, from 401,400 without the CalTrain downtown extension to 385,500 boardings with the extension in 2010. Under the Aerial Design Option LPA, CalTrain boardings would increase by 24 percent, from 46,700 without the downtown extension to 57,800 with the extension in 2010. This percentage change in CalTrain boardings is identical to that found between Alternatives 3A and 3B in the AA/DEIS/DEIR. The consistency between the project definitions and modeling assumptions for the Base Case Alternative in the AA/DEIS/DEIR and the DEIR/SDEIS allowed the use of ratios as a reasonable approach to approximate patronage changes with the CalTrain downtown extension.

Table 3.1-3
Locally Preferred Alternative
Transit Travel Times (Minutes)(1)
A.M. Peak Period (2010)

Northbound Origins		Destinations: S.F. State	S.F. Civic Center	Union Square	Maritime Plaza	Oakland Center
Hillsdale	Travel Time	50	55	52	55	69
CalTrain	Change From No Build	-24	-4	2	2	0
Airport Intermodal	Travel Time	33	38	37	41	53
Station	Change From No Build	-14	-7	-2	-1	-4
SFIA	Travel Time	45	43	48	52	63
Terminals	Change From No Build	-6	0	0	0	0
So. San Francisco	Travel Time	43	46	37	40	55
CalTrain	Change From No Build	-12	0	0	0	0
Hickey	Travel Time	24	29	30	32	46
BART	Change From No Build	-6	-19	-8	-8	-8

Southbound Origins		Destinations: Kaiser Medical	Tanforan Shopping	San Bruno City Hall	Hillsdale Shopping	SFIA Terminals	UAL (SFIA)
12th Street	Travel Time	41	47	58	86	61	62
BART (Oakland)	Change From No Build	-24	-27	-15	0	0	-18
Montgomery St.	Travel Time	32	34	43	72	44	47
BART	Change From No Build	-18	-25	-15	-1	0	-4
Civic Center	Travel Time	28	30	39	68	37	41
BART	Change From No Build	-18	-25	-15	-3	0	3
Daly City	Travel Time	13	15	24	53	31	28
BART	Change From No Build	-11	-18	-9	-18	-19	-14

Source: Parsons Brinckerhoff, July 1995

1) Travel times include walk or transit access time to final destination. It does not include origin station access time, which varies depending on location of traveller's origination. Travel times assume utilization of the fastest mode (i.e., bus, BART, or CalTrain). Times shown are unweighted. and represent the difference from No Build.

Table 3.1-4
Locally Preferred Alternative
Daily Transit Operator Boardings (1)

Transit System	1993 (Base Year)	1998 (Year of Opening)	2010 (Horizon Year)
BART without CalTrain Extension	312,700	358,900	401,400
BART with CalTrain Extension (2)	300,300	344,600	385,500
CalTrain without Extension	36,400	41,700	46,700
CalTrain with Extension (2)	45,000	51,700	57,800
SamTrans	66,500	76,300	85,400
Airport Light Rail System	3,900	5,000	6,200
	Change from Alternative I (No Build)		
Transit System	1993 (Base Year)	1998 (Year of Opening)	2010 (Horizon Year)
BART without CalTrain Extension	56,700	37,600	42,000
BART with CalTrain Extension (2)	44,300	23,300	26,100
CalTrain without Extension	15,600	12,100	8,900
CalTrain with Extension (2)	24,200	22,100	20,000
SamTrans	(7,300)	(5,000)	(2,800)
Airport Light Rail System	3,900	5,000	6,200

Source: MTC, BART-SFO AA/DEIS/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO DEIR/SDEIS Patronage Forecasts, October 1993
Parsons Brinckerhoff, July 1995

1) Boardings are the total number of patrons entering transit vehicles from all sources including transfers,auto, and walk access. More transfers occur between BART and CalTrain without the CalTrain downtown extension than with the downtown extension. Therefore, the sum of boardings for BART and CalTrain are greater without the downtown extension. However, total regional transit person trips, which do not include transfers, would be greater with the downtown extension.

2) Patronage estimates not from MTC's regional model but rather based on changes in Base Case and 1992 LPA for boardings with and without CalTrain downtown extension as forecasted in the AA/DEIS/DEIR.

Table 3.1-5 shows the daily transit boardings at each BART station in San Mateo County for the Aerial Design Option LPA. Further details on trip type and access mode are contained in Appendix B of this document.

4. *Regional transit ridership, particularly for trips originating in or destined for northern San Mateo County, would increase. (B)*

   Table 3.1-6 shows total transit person trips for the nine-county Bay Area region for the Aerial Design Option LPA. A comparison of this regional transit total to transit ridership under the No Build Alternative in the same analysis year indicates that the Aerial Design Option LPA would increase regional transit ridership.

   Table 3.1-7 shows daily trips to the SFIA by mode and indicates a significant shift to rail transit (from bus and automobile use) compared to the No Build Alternative. Increased transit usage would reduce auto congestion and air pollution. In 1998, the percentage of transit riders destined to the SFIA would increase from 8.9 to 14.1 percent; to northern San Mateo County, from 7.0 to 9.5 percent; and to downtown San Francisco, from 34.8 to 40.8 percent.

5. *Regional transit transfers that are required to complete the trip from origin to destination would be the same as under the No Build Alternative. New transfer opportunities between BART-CalTrain and BART-ALRS would be created that would connect rail services among San Francisco, San Jose, Oakland, and other cities in the Bay Area and would connect these rail services to the SFIA. (B)*

   Table 3.1-8 shows the average number of transfers required for all transit trip-making in the region with the Aerial Design Option LPA. New transfer opportunities would occur with the BART extension between BART and CalTrain at the Millbrae Avenue Station that otherwise would not be available. The BART alignment into the SFIA would create a transfer opportunity between BART and the ALRS at the Airport International Terminal Station. Transfers between CalTrain and the ALRS would require the intermediate use of BART.

   Table 3.1-9 shows the transfer volumes projected at these stations. Transfer opportunities are a beneficial effect of the Aerial Design Option LPA because of the unavailability of these transfers under the No Build Alternative. Using the method to estimate boardings with the proposed CalTrain downtown extension described above under Impact 3, estimates were also made of the number of BART and CalTrain intermodal transfers with the CalTrain downtown extension. For example, the BART-ALRS transfers under Alternative 3A are forecast at 13,900 in the year 2010 and at 13,300 transfers under Alternative 3B, an approximate 4 percent reduction in transfers with the CalTrain downtown extension. Accordingly, the 7,700 transfers forecast under the Aerial Design Option LPA without the downtown extension would be reduced by 4 percent, to 7,400 transfers, with the downtown extension. An exception to this method of factoring based on Alternative 3A and 3B in the AA/DEIS/DEIR was made for the BART/CalTrain transfers under the Aerial Design Option LPA. The CalTrain downtown extension would affect transit patronage to and from downtown San Francisco, but it would not affect the number of CalTrain riders in San Mateo County going into and out of the SFIA. Under the Aerial Design Option LPA, in 2010, 5,200 CalTrain riders from south of the SFIA are estimated to travel to and from the SFIA, with BART providing the only direct rail access to the SFIA. These riders were subtracted from the 24,200 transfers between BART and CalTrain under the Aerial Design Option LPA before the

Table 3.1-5
BART Daily Patronage By Station (1)
Locally Preferred Alternative

Station	1993 No Build	1993 (2) LPA
Daly City	12,500	11,900
Colma	N/A	14,600
Subtotal	12,500	26,500
Hickey	N/A	7,200
Tanforan	N/A	8,500
Airport International Terminal	N/A	11,500
Millbrae Avenue	N/A	28,900
Subtotal	N/A	56,100
TOTAL	12,500	82,600
	1998 No Build	**1998** LPA
Daly City	12,800	12,600
Colma	32,700	15,400
Subtotal	45,500	28,000
Hickey	N/A	7,600
Tanforan	N/A	9,100
Airport International Terminal	N/A	14,400
Millbrae Avenue	N/A	30,900
Subtotal	N/A	62,000
TOTAL	45,500	90,000
	2010 No Build	**2010** LPA
Daly City	13,600	13,300
Colma	35,200	16,200
Subtotal	48,800	29,500
Hickey	N/A	8,000
Tanforan	N/A	9,800
Airport International Terminal	N/A	17,800
Millbrae Avenue	N/A	33,000
Subtotal	N/A	68,600
TOTAL	48,800	98,100

Source: See Appendix Table A.

1) Patronage is defined as the number of entrances and exits at a particular station.
2) Analysis of 1993 build alternatives assumes the project is implemented in the baseline year (even though the actual opening year is 1998) and is provided as a means of measuring impacts due solely to the project without influences from general growth or other changes.

Table 3.1-6
Regional Transit Person Trips (Linked Trips) (1)(2)
Daily Volumes by Trip Purpose and Year

	1993	1998	2010
Work Trips	515,200	561,200	604,100
Non-Work Trips	587,200	640,200	691,000
TOTAL	1,201,400	1,201,800	1,295,100
Change From No Build conditions(3)	61,700	20,400	23,200

Sources: MTC, BART-SFO AA/DEIS/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO DEIR Patronage Forecasts, October 1993
Parsons Brinckerhoff, July 1995

1) The region is defined as the nine-county Bay Area region, including the counties of San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Marin, Sonoma, Napa, and Solano.

2) Linked trips may involve the use of one or more transit systems, but the total trip from origin to destination is counted as one transit trip.

3) 1993 No Build does not include BART to Colma.

factoring was applied, because the CalTrain downtown extension would not affect their destination choice of the SFIA. Once the factoring was performed, these 5,200 CalTrain riders were added back to the number of transfers between BART and CalTrain to arrive at the 11,800 transfers under the Aerial Design Option LPA with the CalTrain downtown extension.

6. *SFIA airline terminals would be within walking distance from BART. (B)*

The BART Airport International Terminal Station on SFIA property allows air passengers to walk to the most frequently used terminals, with the option to transfer to the ALRS, which would be close to the BART station. In the event the ALRS becomes non-operational, BART customers would be able to walk to their airline terminal destinations. The distances from the mid-point of the platform to the nearest counters at the planned International Terminal and the North Terminal are 760 feet and 1,400 feet, respectively. The BART station would be on the departure level of the planned International Terminal, which is one level below the ALRS.

Table 3.1-7
Locally Preferred Alternative
Daily Trips by Mode
to the SFIA

Transit System	1993 (Base Year)	1998 (Year of Opening)	2010 (Horizon Year)
AIR PASSENGERS (1)			
BART	5,000	5,800	7,200
CalTrain	2,200	2,600	3,200
Bus	10,200	12,000	14,800
Auto	85,400	100,300	123,800
TOTAL	102,800	120,700	149,000
WORK AND OTHER			
BART	3,100	4,300	5,400
CalTrain	1,200	1,600	2,000
Bus	500	600	800
Auto	46,000	63,800	79,500
TOTAL	50,800	70,300	87,700
TOTAL SFIA TRIPS			
BART	8,100	10,100	12,600
CalTrain	3,400	4,200	5,200
Bus	10,700	12,600	15,600
Auto	131,400	164,100	203,300
TOTAL	153,600	191,000	236,700

	Change From Alternative I (No Build)		
TOTAL SFIA TRIPS	1993 (Base Year)	1998 (Year of Opening)	2010 (Horizon Year)
BART	8,100	10,100	12,600
CalTrain	3,000	3,600	4,500
Bus	(4,300)	(5,600)	(7,000)
Auto	(6,800)	(8,200)	(10,100)

Source: MTC, BART-SFO AA/DEIS/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO DEIR/SDEIS Patronage Forecasts, October 1993
Parsons Brinckerhoff, July 1995

1) Air passengers includes visitors and greeters as well as air passengers.
2) CalTrain riders to SFIA are required to transfer to BART. These CalTrain riders are included only under CalTrain and are not included in the number BART trips to SFIA.

Table 3.1-8
Locally Preferred Alternative
Regional Transit Boardings and Transfers (1)
Daily Volumes By Year

	1993 (Base Year)	1998 (Year of Opening)	2010 (Horizon Year)
Total Transit Boardings	1,656,200	1,901,000	2,127,000
Change From No-Build	84,300	25,400	28,400
Transfers Per Transit Person Trip (2)	0.502	0.582	0.642
Change From No-Build	(0.008)	(0.006)	(0.008)

Source: MTC, BART-SFO AA/DEIS/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO DEIR/SDEIS Patronage Forecasts, October 1993
Parsons Brinckerhoff, July 1995

1) The region is defined as the nine-county Bay Area region, including the counties of San Francisco, San Mateo, Santa Clara, Alameda, Contra Costa, Marin, Sonoma, Napa, and Solano.
2) Total transit boardings divided by regional transit person trips from Table 3.1-6 minus 1 which represents the boardings on the first transit system. The 1,295,300 linked transit trips from Table 3.1-6 is divided by the 2,127,200 transit boardings in the year 2010 to obtain 1.642, then minus 1 yields 0.642.

Table 3.1-9
Daily Intermodal Transfers
Between Rail Services

Weekday Transfers Between Operators	1993	1998	2010
BART-CalTrain w/o CalTrain Ext.	19,400	21,700	24,100
BART-CalTrain w/ CalTrain Ext.	10,100	10,900	11,800
BART-ALRS w/o CalTrain Ext.(2)	4,900	6,300	7,700
BART-ALRS w/ CalTrain Ext.(1)(2)	4,700	6,000	7,400
CalTrain-ALRS (3)	N/A	N/A	N/A

Sources: MTC, BART-SFO AA/DEIS/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO DEIR/SDEIS Patronage Forecasts, October 1993
Parsons Brinckerhoff, July 1995

1) These transfer estimates are not from MTC's regional model but rather are based on changes in transfers under the Base Case Alternative and the 1992 LPA, with and without the CalTrain downtown extension, as forecast in the AA/DEIS/DEIR.

2) BART-ALRS transfers do not include individuals who walk between BART and their airport destinations.

3) These transfers require an intermediate transfer to BART and are included in the BART-CalTrain volumes.

7. *Geographic coverage by rail transit within the study area, including the SFIA, would improve with new BART service and expanded CalTrain service. Rail service would enhance transit service in general for northern and mid-San Mateo County and reduce automobile use. (B)*

   Rail transit geographic coverage would be improved with the BART extension due to the new stations, making transit more accessible from locations in northern and central San Mateo County. Improved service would contribute to increases in transit use and reductions in automobile use, according to the MTC modeling results.

8. *Reliability of transit services in northern San Mateo County would improve, since rail service would increase relative to bus service, and rail provides more reliable, on-time performance. (B)*

   The reliability of a transit system plays a significant role in the decision to use transit. This is particularly important when transfer connections are necessary, because unreliable arrival or departure times may mean missing the connection. The amount of time spent waiting for a transit vehicle is considered by travelers when choosing their best option. Rail transit is inherently more reliable than bus transit in terms of maintaining scheduled arrivals and departures, because rail modes operate on dedicated rights-of-way not subject to traffic delays.

9. *The Aerial Design Option LPA would relieve crowded conditions projected for the Colma Station (see Table 3.1-5) by attracting BART riders to other stations along the alignment. (B)*

Table 3.1-5 shows that the patronage at the Colma Station would decrease from 32,700 patrons under the No Build Alternative to 15,400 patrons under the Aerial Design Option in 1998. Thus, it would not be necessary to expand facilities at the Colma Station under the Aerial Design Option LPA.

Cumulative Analysis

The modeling exercise used to predict future BART transit effects includes assumptions about other transit operators. The previously discussed BART effects, thus, encompass the impacts of adding BART service, increasing the number of CalTrain trains, and reorienting SamTrans bus service. The methodology is in effect a cumulative analysis. Accordingly, the number of all cumulative effects are either insignificant or beneficial.

1.4 Traffic Impact Assessment and Mitigation

Significance Criteria and Methodology

The level of service (LOS) concept qualitatively characterizes traffic conditions associated with varying levels of traffic. It is a measure of congestion, which is the principal indicator of roadway service. Traffic conditions are evaluated for the A.M. and P.M. peak hours, when traffic volumes are greatest, using the level of service definitions for intersections and freeway segments in Tables 3.1-10a, 3.1-10b, and 3.1-10c. The levels range from LOS A which indicates free flow conditions to LOS F which indicates a jammed, stop-and-go condition. LOS A, B, and C are generally considered to be satisfactory service levels, while LOS D is marginally acceptable, LOS E is undesirable, and LOS F conditions are unacceptable.

A significant impact is defined as any increase in traffic which causes an intersection, freeway segment, or weaving section operating at LOS D or better to deteriorate to LOS E or F or which causes a roadway facility operating at LOS E to deteriorate to LOS F when compared to the No Build Alternative in the same analysis year. In addition to these criteria, intersections located in residential neighborhoods are held to higher standards, because of their sensitivity to changes in traffic conditions. If a residential intersection degrades two or more levels of service, regardless of the initial service level, this change is considered to be a significant impact. Significant cumulative impacts occur when a facility (i.e., freeway segment or intersection) already at LOS E or F experiences an increase in traffic by two or more percent when compared to the No Build Alternative.

The transportation impact analysis is based on the MTC's 1990 and 2010 travel demand forecasts; MTC's model projects future traffic levels on the corridor's highway systems. A sub-area traffic model was developed to assign MTC's traffic forecasts to the local transportation network. The sub-area model included more streets in the study area than the regional model and allocated individual trips to BART stations in the project corridor. Detailed information on the methodologies used to develop the sub-area traffic and to analyze the traffic level of service is contained in the Transportation Technical Report of December 1994, prepared in conjunction with the DEIR/SDEIS.

Table 3.1-10a
Level of Service Definitions
Controlled Access Roadways
Freeway

Level of Service	Interpretation	Volume/Capacity Ratio	Speed (MPH)
A, B	Free flow operation; stable traffic flow.	< 0.54	≥57
C	Speed and lane changing constrained by other vehicles.	0.55 - 0.77	≥54
D	Lower speeds; susceptible to changing operating conditions; traffic operation approaches instability.	0.78 - 0.93	≥46
E	Unstable flow; volumes approaching roadway capacity; slow speeds.	0.94 - 1.0	≥30
F	Forced flow conditions; stop-and-go operating conditions.	1.0	<30

Source: Highway Capacity Manual, Special Report 209, Table 3.1 Level of Service for Basic Freeway Segments Transportation Research Board, 1985.

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Table 3.1-10b
Level of Service Definitions
Signalized Intersections

Level of Service	Stopped Delay (sec/veh)	Volume to Capacity Ratio	Description of Traffic Condition
A	≤ 5.0	0.00 - 0.60	Insignificant Delays: No approach phase is fully utilized and no vehicle waits longer than one red indication.
B	5.1 - 15.0	0.61 - 0.70	Minimal Delays: An occasional approach phase is fully utilized. Drivers begin to feel restricted.
C	15.1 - 25.0	0.71 - 0.80	Acceptable Delays: Major approach phase may become fully utilized. Most drivers feel somewhat restricted.
D	25.1 - 40.0	0.81 - 0.90	Tolerable Delays: Drivers may wait through more than one red indication. Queues may develop but dissipate rapidly, without excessive delays.
E	40.1 - 60.0	0.91 - 1.00	Significant Delays: Volumes approaching capacity. Vehicles may wait through several signal cycles and long queues of vehicles form upstream.
F	≥ 60.0	NA	Excessive Delays: Represents conditions at capacity, with extremely long delays. Queues may block upstream intersections.

Source: Highway Capacity Manual, Special Report No. 209, Transportation Research Board, 1985.

Table 3.1-10c
Level of Service Definitions
Unsignalized Intersections

Reserve Capacity (PCPH)	Level of Service	Expected Delay To Minor Street Traffic
≧400	A	Little or no delay
300-399	B	Short traffic delays
200-299	C	Average traffic delays
100-199	D	Long traffic delays
0-99	E	Very long traffic delays
*	F	*

Source: San Francisco Department of Public Works, Traffic Division, Bureau of Engineering from information in Highway Capacity Manual, Special Report 87, Highway Research Board, 1965.

Note: PCPH is passenger car equivalents per hour.

* When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement to the intersection.

This section presents the traffic impact of the proposed project on freeways and local roadways in the analysis years 1993, 1998 and 2010 by comparing the No Build Alternative with the Aerial Design Option LPA. The impact analysis identifies impacts on the Highway 101 mainline and weaving sections affected by BART access traffic in the study area, as well as on local intersections near stations. A total of 63 existing and 34 proposed new intersections to be constructed in conjunction with station area roadway improvements were analyzed (see Appendix C of this document). The intersections are shown in Figure 3.1-1 and the ones relevant to the Aerial Design Option LPA are listed in Table 3.1-11.

Project-Specific Analysis

Freeway

10. *The Aerial Design Option LPA would reduce peak-hour traffic volumes on Highway 101 north of Millbrae Avenue. (B)*

    Table 3.1-12 illustrates the effect of project-related traffic on freeway segments in the study area. Traffic volumes on Highway 101 north of Millbrae Avenue would decrease as commuters switched to BART. This decrease is forecast to be as high as 700 vehicles in the northbound direction during the A.M. peak hour and as high as 500 vehicles in the southbound direction during the P.M. peak hour, depending on the analysis year and location. The greatest benefits would occur north of I-380. Service levels north of Millbrae Avenue would be generally comparable to those under No Build; the freeway would generally operate in the LOS C or D range.

11. *The freeway segment between Millbrae Avenue and Broadway in the A.M. peak hour would deteriorate from LOS E under the No Build Alternative in 1993 to LOS F. (S)*

In 1998, operations on the freeway segment between the SFIA and Millbrae Avenue are projected to degrade from LOS D/E to LOS E in the A.M. peak hour under the proposed project. The freeway segment between Millbrae Avenue and Broadway in the A.M. peak hour would deteriorate from LOS E under the No Build Alternative in 1993 to LOS F under the proposed project.

Traffic would increase as automobiles utilized these freeway sections to access BART stations on the extension, diverted either from other car routes or transit modes. The number of people destined for San Francisco from points south of the project corridor would not change, but there would be a diversion of auto drivers from other highways to Highway 101. (Of those people driving to BART–SFIA Extension stations, an estimated 60 percent would use Highway 101, according to travel assignments from the subarea traffic model.) Regardless of the source of traffic, the increased vehicular volume on this portion of Highway 101 constitutes a significant adverse impact.

MITIGATION MEASURES. Traffic projections already assume improved transit service to BART stations. Nevertheless, a study will be performed by BART to analyze whether increasing CalTrain and/or SamTrans would reduce the traffic increase on the freeway to an insignificant level. If the study results indicate such reductions are possible, transit service would be enhanced, although funding constraints might preclude improved service. Thus, this impact would remain significant and unavoidable. Widening of the freeway was considered but deemed inappropriate because of environmental impacts. The Aerial Design Option LPA would increase traffic volumes by less than 600 vehicles during the A.M. peak hour.

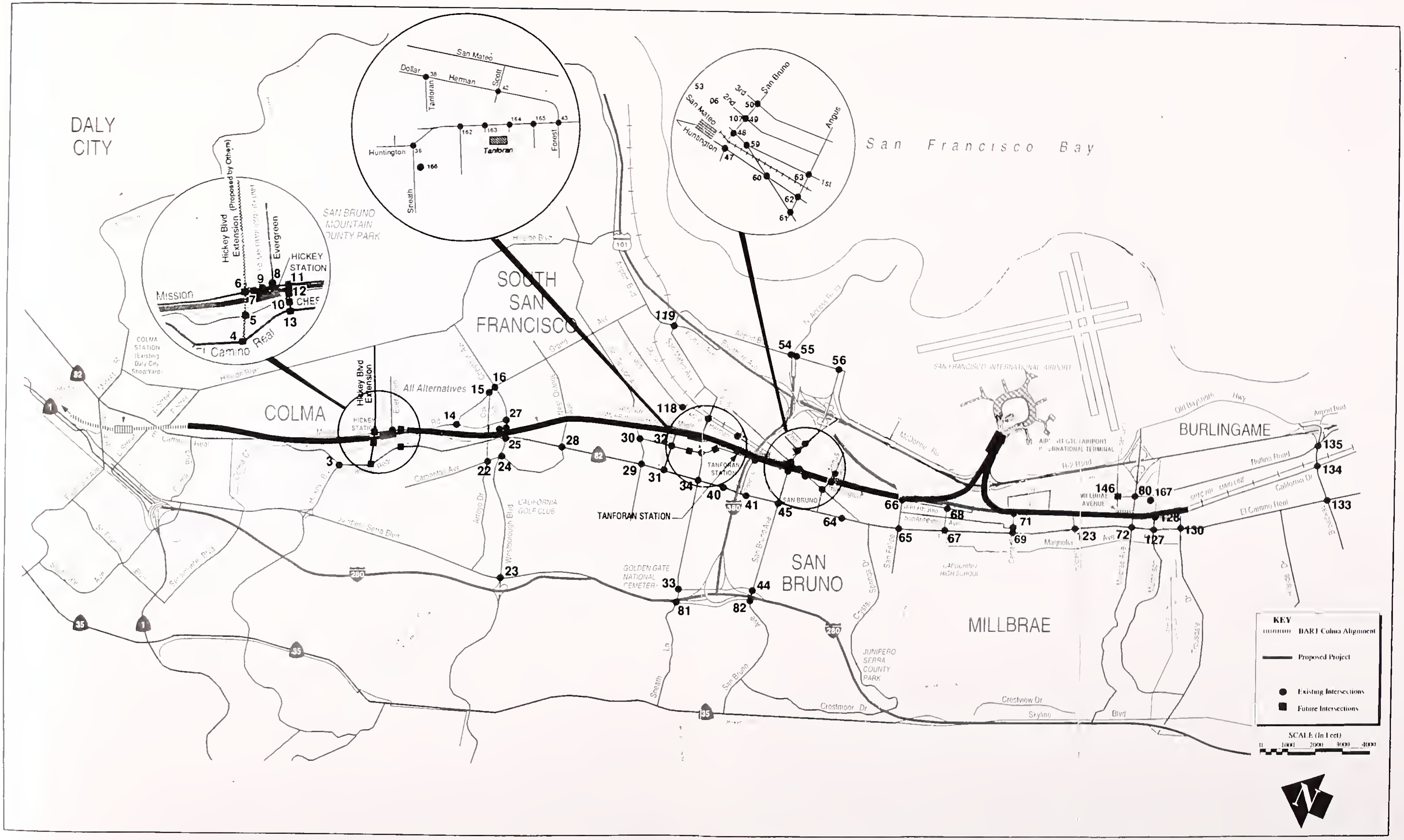
12. *The Aerial Design Option LPA would improve the Highway 101 weaving condition south of the SFIA. (B)*

Table 3.1-13 summarizes the estimated LOS for the southbound Highway 101 weaving section between the San Bruno Avenue on-ramp and the Millbrae Avenue off-ramp. The Aerial Design Option LPA would reduce traffic volumes through the weaving section. In 1998, the weaving section from the SFIA on-ramp to the Millbrae off-ramp would improve from LOS E to LOS D/E. In 2010, the weave volume would decrease on this segment and operate at LOS E under the Aerial Design Option LPA, compared to LOS F under the No Build Alternative.

Intersections

The results of the intersection operations analysis for the Aerial Design Option LPA are presented in Appendix C of this document.

13. *The Aerial Design Option LPA is forecast to significantly improve peak-hour traffic conditions relative to the No Build Alternative at El Camino Real/Westborough in 2010, as a result of traffic diverted to BART or because of proposed roadway improvements. (B)*



OGDEN

Intersections Potentially Affected by
BART-San Francisco Airport Extension

FIGURE
3.1-1

Table 3.1-11
Analysis Intersection
Existing or Proposed

Intersection	Existing or Proposed
3. El Camino Real & Hickey Boulevard	E
4. El Camino Real & Hickey Extension	P
5. Hickey Station Exit & Hickey Extension	P
6. Mission & Hickey Extension	P
7. Mission & Hickey Station Entrance (KNR) [1]	P
8. Mission & Evergreen	E
9. Mission & Hickey Station Exit (KNR) [1]	P
11. Mission & New Street	P
12. Hickey Station Bus Entrance & New Street	P
10. Hickey Station Entrance & New Street	P
13. El Camino Real & New Street	P
14. Mission & Grand	E
15. Oak & Grand	E
16. Chestnut & Grand Avenue	E
19. Mission & Oak	E
21. El Camino Real & Arroyo	E
22. Camaritas & Arroyo	E
23. Junipero Serra Boulevard & Westborough	E
24. Camaritas & Westborough	E
25. El Camino Real & Westborough	E
26. Antoinette & Chestnut	E
27. Mission & Chestnut	E
28. El Camino Real & Orange	E
29. El Camino Real & Spruce	E
30. Huntington & Spruce	E
31. El Camino Real & Noor	E
32. Huntington & Noor	E
33. Northbound I-280 & Sneath	E
81. Southbound I-280 & Sneath	E
34. El Camino Real & Sneath	E
36. Huntington & Sneath	E
38. Dollar/Herman & Tanforan Station Entrance	E
40. El Camino Real & Westbound I-380	E
41. El Camino Real & Eastbound I-380	E
42. Herman & Scott	E
43. Huntington & Forest	E
44. Northbound I-280 & San Bruno	E
82. Southbound I-280 & San Bruno	E
45. El Camino Real & San Bruno	E
47. Huntington & San Bruno	E
48. San Mateo & San Bruno	E
49. Second & San Bruno	E
50. Third & San Bruno	E
59. San Mateo & First	E
60. San Mateo & Huntington	E
61. San Mateo & Angus	E
62. Huntington & Angus	E
63. First & Angus	E
54. South Airport & I-380 On-Ramp	E
55. South Airport & I-380 Off-Ramp	E
56. South Airport & San Bruno	E
64. El Camino Real & Jenevein	E
65. El Camino Real & San Felipe	E
66. Huntington & San Felipe	E
67. El Camino Real & Santa Inez	E
68. San Antonio (Huntington) & Santa Inez	E

Table 3.1-11
Analysis Intersection
Existing or Proposed

Intersection		Existing or Proposed
69.	El Camino Real & Center	E
70.	San Anselmo & Center	E
71.	Monterey & Center	E
72.	El Camino Real & Millbrae	E
80.	Rollins & Millbrae	E
118.	Dollar & South Linden	E
119.	San Mateo & Produce & Airport	E
123.	El Camino Real & Hillcrest	E
127.	El Camino Real & Murchison	E
128.	California/Murchison	E
130.	El Camino Real & Trousdale	E
133.	El Camino Real & Broadway	E
134.	California & Broadway	E
135.	Rollins & Highway 101 & Southbound Broadway	E
146.	Rollins & New Access	P
162.	Huntington & Tanforan Bus Entrance/Exit North	P
166.	Sneath & Sears Entrance	E
167.	Rollins & Adrian	E

Source: Parsons Brinkerhoff, April 1994

Note: Intersections listed in north to south order, generally by station location.
Intersection numbers assigned by travel model.

1) Kiss-and-ride.

Table 3.1-12
Locally Preferred Alternative
Estimated Freeway Impacts
Highway 101

	Northbound AM Peak Hour							Southbound PM Peak Hour						
Freeway Segment	No. Lanes	1993 Veh. Vol.	LOS	1998 Veh. Vol.	LOS	2010 Veh. Vol.	LOS	No. Lanes	1993 Veh. Vol.	LOS	1998 Veh. Vol.	LOS	2010 Veh. Vol.	LOS
Airport Blvd - I-380	5	7900	C	8100	C	8300	D	5	7600	C	7800	C	8100	D
San Bruno - SFIA	6	8100	C	8600	C	9000	C	5	7000	C	7400	C	7800	C
SFIA - Millbrae	5	9000	D	9500	D	9900	E	5	8400	D	9100	D	9700	D
Millbrae - Broadway	4	9300	F	9800	F	10200	F	4	8400	E	9000	F	9700	F
Broadway/Anza - Pen.insulaPoplar	4	9500	F	9900	F	10200	F	4	8500	E	9000	F	9500	F
Poplar/Dore - 3rd Ave.	4	9300	F	9900	F	10400	F	4	8500	E	9000	F	9500	F

Estimated Freeway Impacts
Net Change in Volume Compared with No Build Alternative
Highway 101

	Northbound AM Peak Hour						Southbound PM Peak Hour					
Freeway Segment	1993 Veh. Vol.	Percent Change	1998 Veh. Vol.	Percent Change	2010 Veh. Vol.	Percent Change	1993 Veh. Vol.	Percent Change	1998 Veh. Vol.	Percent Change	2010 Veh. Vol.	Percent Change
Airport Blvd - I-380	-200	-2.5%	-300	-3.6%	-500	-5.6%	-600	-7.3%	-700	-8.2%	-600	-6.9%
San Bruno - SFIA	-200	-2.4%	-200	-2.3%	-200	-2.2%	-400	-5.4%	-500	-6.3%	-500	-6.0%
SFIA - Millbrae	-200	-2.2%	-200	-2.1%	-300	-2.9%	-300	-3.4%	-400	-4.2%	-500	-4.9%
Millbrae - Broadway	400	4.5%	500	5.4%	400	4.1%	200	2.4%	100	1.1%	100	1.0%
Broadway/Anza - Pen.insulaPoplar	400	4.4%	300	3.1%	200	2.0%	200	2.4%	100	1.1%	0	0.0%
Poplar/Dore - 3rd Ave.	200	2.2%	300	3.1%	300	3.0%	100	1.2%	0	0.0%	-100	-1.0%

Source: Parsons Brinckerhoff, April 1994

Notes:
1) Lane capacities based on Highway Capacity Manual, Table 7-1 (May 1992), and adjusted to reflect observed conditions of average capacity for Highway 101 between 3rd Avenue and Millbrae Avenue.

Key:

Level of Service (LOS)	Per-Lane Volume
A	Up to 720
B	Up to 1200
C	Up to 1650
D	Up to 1940
E	Up to 2200
F	2201 or above

Table 3.1-13
Locally Preferred Alternative
Estimated Freeway Weaving Section LOS(1)
Highway 101 Southbound SFIA Interchange to Millbrae Interchange

Weaving Section	1993 Base Year	1998 Year of Opening	2010 Horizon Year
San Bruno Avenue collector road on-ramp to SFIA on-ramp	D D	E E	E/F E
SFIA on-ramp to Millbrae off-ramp	D/E D	E D/E	F E

Source: Parsons Brinckerhoff, April 1994.

1) No Build LOS
LPA LOS

The Hickey Boulevard extension between El Camino Real and Mission Road, together with the diversion of existing traffic to BART, would improve the level of service at the intersection of El Camino Real/Westborough in 2010. The level of service at this intersection would be LOS E under the No Build Alternative during the P.M. peak hour and would improve to LOS C under the in 2010.

14. *The Aerial Design Option LPA would degrade LOS by two or more levels at two intersections compared to the No Build Alternative in the same analysis year. (I)*

Under the Aerial Design Option LPA, LOS at two intersections would degrade by two or more levels:

- The intersection of Oak/Grand is forecast to deteriorate in the peak hour from LOS A to LOS C for 1998 and 2010. The specific movement triggering the deterioration in LOS is the Oak Avenue left turn onto Grand Avenue. Less than five vehicles would experience this decrease in LOS, and the vast majority (99 percent) of vehicles would experience either no delay or an LOS A. As a result, this effect is considered insignificant.

- The intersection of El Camino Real/Murchison would deteriorate in the A.M. peak hour from LOS B to D in 1998, compared to No Build. The difference in traffic volumes is due both to the Millbrae Avenue Station and to the Millbrae grade separation (which would force northbound vehicles off California Drive and onto El Camino Real). The intersection is in a commercial area; therefore, the change in LOS would be less noticeable. The reduction in LOS is considered acceptable compared to the same impact in a residential area.

15. *The Aerial Design Option LPA is forecast to have an adverse impact at one new and three existing intersections during the A.M. or P.M. peak hours relative to the No Build Alternative. (S)*

As a result of traffic oriented to and from proposed BART stations, the Aerial Design Option LPA would have an adverse impact at four intersections:

- The new intersection at the Hickey Station exit/Hickey Boulevard extension would operate at LOS F in the 1998 and 2010 P.M. peak hour.
- The P.M. peak-hour LOS at the intersection of El Camino Real/Sneath would deteriorate from LOS D to E in the 1998.
- The existing intersection of Sneath/Sears entrance would deteriorate to LOS F during the P.M. peak hour in the year 2010.
- The LOS C in the 1998 P.M. peak hour and the 2010 LOS D at El Camino Real/Millbrae are projected to degrade to LOS E.

MITIGATION MEASURES. Implementation of the following measures would reduce impacts to the Hickey Station exit/Hickey Boulevard, El Camino Real/Sneath, and Sneath Avenue/Sears Entrance intersections to an insignificant level. Mitigations are also proposed at the intersection of El Camino Real/Millbrae but the impact would remain significant and unavoidable until such time as the proposed improvements which rely on other agencies are constructed. BART's fair share of costs associated with the intersection improvements put forth in Mitigation Measures 15.2 and 15.3 below will be based on each direct project impact calculated against the total estimated cost of the improvement. BART funds toward the improvements will be contributed before closeout of the Full Funding Grant Agreement project and only upon implementation of the proposed improvements.

15.1 *All-Way Stop Control at Hickey Station Exit and the Hickey Boulevard Extension.* BART will design station access during final design to include all-way stop signage at this intersection. This traffic control measure would enable the intersection to operate at LOS B during the P.M. peak hour of all analysis years.

15.2 *Intersection Improvements at El Camino Real/Sneath Lane.* This intersection is forecast to improve to an LOS D during the P.M. peak hour when the City of San Bruno's programmed improvements are completed. These improvements will provide additional lanes on all approaches, including additional exclusive left turn lanes on Sneath Lane, so that existing split-signal phasing may be removed. BART will contribute a fair share of the cost of this improvement, based on the direct project impact identified in the 1998 analysis and not to exceed $900,000.

15.3 *Traffic Signal Control at Sneath Lane and Sears/Burger King Entrance.* This intersection is currently all-way stop controlled. The addition of BART-related traffic traveling through this intersection in the westbound direction during the P.M. peak hour would reduce the level of service from LOS D under the No Build Alternative to LOS F. The addition of a traffic signal at this intersection would improve traffic operations to LOS B. BART will contribute a fair share of the cost of this improvement, based on the direct project impact identified in the 1998 analysis.

15.4 *Contribution to Future Intersection Improvement at El Camino Real/Millbrae Avenue.* In the future, BART will contribute to the cost of improvements at the intersection of El Camino Real/Millbrae. This contribution will be based on the cost of widening Millbrae Avenue to

create an additional eastbound through lane. The widening would involve a land and business acquisition, as well as retrofitting the Millbrae Avenue overpass with an additional lane on the north side of the structure. It is within the legal authority of other agencies (Caltrans and the City of Millbrae) to construct the improvements. Another possible alternative traffic improvement might be the City of Millbrae's proposed extension of California Avenue to an extended Victoria Avenue with a new BART garage, located in the vicinity of the intersection of those two extended streets. BART funding contribution for these potential improvements would not exceed the contribution calculated for an eastbound lane described above and are estimated at $5,100,000.

16. *The Millbrae Avenue Station would increase traffic volume at the Broadway/Rollins/Highway 101 off-ramp intersection, but the intersection level of service would remain acceptable. (I)*

The Millbrae Avenue Station under the Aerial Design Option LPA includes a new road connecting the BART parking garage and surface lot to Adrian Road. This new, one-way southbound roadway would serve as an exit from the station to Adrian Road and then to Rollins Road. The intersection of Rollins/Adrian would be signalized, and the level of service at this intersection in 2010 is projected at LOS A during both the A.M. and P.M. peak hours. This signal would require coordination with the signal at the Millbrae/Rollins intersection. With the Adrian Road connection, some drivers destined for southbound Highway 101 may turn south onto Rollins Road and enter Highway 101 at the Broadway interchange rather than at the Millbrae Avenue interchange. The LOS at the intersection of Broadway/Rollins/Highway 101 off-ramp would be LOS C during the A.M. and P.M. peak hours in 2010 under the Aerial Design Option LPA. Under the No Build Alternative in 2010, this intersection would be at LOS B during the A.M. peak hour and LOS C during the P.M. peak hour.

Cumulative Analysis

The following cumulative impacts are derived by comparing 1993 No Build conditions to future analysis years with and without a BART extension.

Freeway

17. *Traffic would increase peak-hour volumes in 1998 and 2010 under the Aerial Design Option LPA on Highway 101 between the SFIA and Third Avenue, freeway segments that would already operate at unacceptable levels of service under the No Build Alternative. (S)*

Without the BART extension, significant deterioration of freeway operations is expected at several locations due to projected growth in population and employment. During the 1993 A.M. peak hour in the northbound direction, the freeway segments between Broadway/Anza and Third Avenue operate at LOS F. The segment between Millbrae and Broadway Avenues would significantly deteriorate, from LOS E in 1993 to LOS F in 1998 and 2010. The freeway segment between the SFIA and Millbrae Avenue operates at LOS D in 1993 but is projected to degrade to LOS D/E in 1998 and to LOS E in 2010.

During the P.M. peak hour in the southbound direction, the freeway section between Poplar/Dore and Third Avenue would deteriorate from LOS E in 1993 to LOS F in 1998 and 2010 under the No

Build Alternative. The section between Broadway/Anza and Peninsula/Poplar is projected to deteriorate from LOS E in 1998 to LOS F in 2010.

With the Aerial Design Option LPA, significant cumulative increases on the freeway segments between Millbrae and Third Avenues range from 2.0 to 5.4 percent in the A.M. peak hour. The greatest cumulative impact would occur on the section between Millbrae Avenue and Broadway in 1998. During the P.M. peak hour, no cumulative impacts would occur on Highway 101 due to the Aerial Design Option LPA.

MITIGATION MEASURES. The study of increased transit service previously identified under the project-specific Impact 11 applies to this cumulative impact. This measure would not reduce the impact to an insignificant level. As a result, this impact is significant and unavoidable.

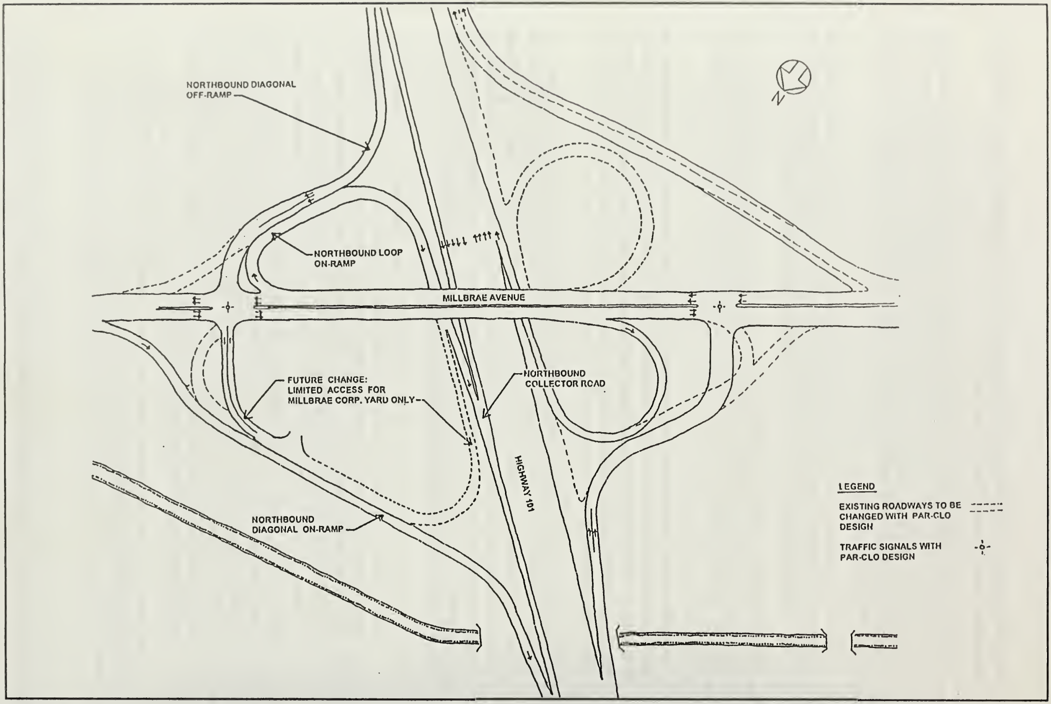
18. *The Aerial Design Option LPA would result in a cumulative worsening of traffic flow on the weaving segment of the northbound collector road between the northbound loop on-ramp from Millbrae Avenue to Highway 101 and the northbound loop off-ramp from Highway 101 to Millbrae Avenue. (S)*

The level of service under the No Build Alternative in 2010 for the weaving segment between the northbound loop on-ramp and off-ramp would be LOS F during the A.M. peak hour. Approximately 500 vehicles would be added to the northbound loop on-ramp by the Aerial Design Option in 2010. This increment of traffic would have a significant cumulative impact on operations of the weaving segment between these two loop ramps.

MITIGATION MEASURES. One method to mitigate this impact is to change the Highway 101 northbound off-ramp to Millbrae Avenue to a partial cloverleaf (Par-Clo) design. The Par-Clo design would eliminate the loop off-ramps from Highway 101 to Millbrae Avenue. Northbound vehicles accessing the Millbrae Avenue BART Station would be required to use the diagonal off-ramp and turn left at a new traffic signal, if such a design were to be implemented. This proposal is recommended as a mitigation measure and would reduce the cumulative impact from the Aerial Design Option LPA and background traffic to an insignificant level.

18.1 *Fair Share Contribution to Future Millbrae Avenue Interchange to Highway 101 Improvements.* The loop off-ramp from northbound Highway 101 to westbound Millbrae Avenue would be closed to vehicles exiting Highway 101, as indicated in Figure 3.1-2. Northbound vehicles on Highway 101 traveling westbound on Millbrae Avenue would exit on the diagonal off-ramp from Highway 101. This northbound diagonal off-ramp from Highway 101 would be reconfigured to a signalized intersection with Millbrae Avenue, where vehicles would turn left to travel west or turn right to travel east. The closure of the loop off-ramp would eliminate the conflicting weave movement with traffic from the northbound loop on-ramp. This highway interchange is in the purview of Caltrans. If Caltrans, in concert with the City of Millbrae or others, were to decide to undertake this project, then BART would contribute its fair share to the cost of these improvements, based on the direct project impact not to exceed $3,480,000.

19. *No additional significant cumulative impacts on freeway segments would occur with the addition of the CalTrain downtown extension. (I)*



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An Example of a Par-Clo Design for Millbrae Avenue Interchange of Highway 101

FIGURE 3.1-2

Based on analysis performed in the AA/DEIS/DEIR, traffic volumes on freeway segments both north and south of the SFIA would be slightly less with the addition of the CalTrain downtown extension to the Aerial Design Option LPA.

Intersections

20. *Cumulative traffic is forecast to have a significant adverse impact at one intersection during the P.M. peak hour in 2010. (S)*

Implementation of the Aerial Design Option LPA, along with background traffic growth, would cause LOS to degrade at the intersection of El Camino Real/Sneath. This interaction is forecast to experience a 4 percent increase in volume/capacity ratio by 2010 compared to the No Build Alternative, which would be at LOS E. This increase is a significant cumulative impact.

MITIGATION MEASURES. The cumulative impact at the intersection of El Camino Real/Sneath would be mitigated to an insignificant level of LOS D during the P.M. peak hour with implementation of the City of San Bruno's programmed improvements, as described in Mitigation Measure 15.2, above.

21. *With the CalTrain downtown extension added to the Aerial Design Option LPA, no additional significant cumulative impacts to local intersections would occur. (I)*

According to the analysis performed in the AA/DEIS/DEIR, traffic volumes during the P.M. peak hour in 2010 would not significantly affect the LOS at intersections in the vicinity of the CalTrain stations within the study area. The traffic volumes during the P.M. peak hour at the Airport Intermodal Station would decline from 1,385 vehicle trips under Alternative 3A (without the CalTrain downtown extension) to 935 under Alternative 3B (with the CalTrain downtown extension). The AA/DEIS/DEIR provides the change in vehicle trips with and without the CalTrain downtown extension for patrons using BART or CalTrain stations between Daly City and Millbrae. Vehicle trips to and from these BART stations decrease by 1,700 in 2010 when comparing Alternative 3A to Alternative 3B, whereas vehicle trips to CalTrain stations in South San Francisco, San Bruno, and Millbrae increase by 100 vehicle trips. Based on a review of the AA/DEIS/DEIR and the transportation impacts, a decline in vehicle trips would occur at the Millbrae Avenue Station if the CalTrain downtown extension were also built; the Millbrae Avenue Station functions as an end-of-the-line station, similar to the Airport Intermodal Station under Alternative 3B.

Changes in traffic volumes during the A.M. peak hour in 2010, when traffic volumes are predicted to be the greatest of the three analysis years, would be the same order of magnitude as changes indicated for the P.M. peak hour.

1.5 Parking Impact Assessment and Mitigation

Significance Criteria

Parking impacts are considered significant if: 1) a loss in off-street parking results in demand exceeding supply, 2) there is a loss in on-street parking fronting a business or residence without its own off-street

parking, or 3) there is project-created parking spillover into residential or commercial areas and formal complaints from city officials are made to BART staff.

Project-Specific Analysis

22. *The Aerial Design Option LPA would reduce the parking space demand at existing San Mateo County BART stations. (B)*

    Table 3.1-14 shows the estimated parking requirements at each station for 2010. Substantial reductions in parking demand would occur at the Daly City and Colma Stations under the Aerial Design Option LPA, compared to the No Build Alternative.

23. *The parking supply at the Hickey, Tanforan, and Millbrae Avenue Stations would be adequate to meet the anticipated demand. Therefore, spillover parking is not expected to occur. (I)*

    BART's policy is to provide sufficient off-street parking and feeder bus service to meet the projected passenger access demand at all new stations. The proposed stations under the Aerial Design Option LPA would be designed to provide parking based on traffic studies required under CEQA, rather than on travel demand modeling. Thus, spillover parking is not anticipated at the Hickey, Tanforan, or Millbrae Avenue Stations, because the parking supply would be more than adequate to meet the anticipated demand, based on these parking and traffic studies. The modeled parking demand at the BART extension stations is based on an average weekday. To accommodate peak parking demand during the year, the supply of parking ranges from 15 to 26 percent above the modeled demand at the Hickey, Tanforan, and Millbrae Avenue Stations.

    MITIGATION MEASURES. Although spillover parking is not projected to be a significant impact, a monitoring program would be implemented to assess whether spillover parking from the BART stations becomes a significant problem due to unanticipated events. If necessary, implementation of residential permit parking program, parking meters, or restricted parking zones would ensure that spillover parking would remain at an insignificant level.

    23.1 *Monitoring Program for Spillover Parking.* A monitoring program will be designed to determine if substantial spillover parking occurs. Formal complaints from official representatives of the city in which spillover parking occurs would be deemed significant once the monitoring program verified that the impact was created by the project. If spillover parking were to cause local parking shortages, the problem could be mitigated with a residential permit parking program (RPP). These programs have been used successfully around other BART stations and activity centers throughout the Bay Area. Patrons who choose to park in a designated RPP area would incur substantial penalties and fines. This program would be an effective deterrent to spillover parking. The implementation of an RPP could have economic impacts on the city.

    On commercial streets, parking meters or restricted parking zones implemented by the City of San Bruno or the City of Millbrae would discourage BART patrons from parking all day on city streets in the vicinity of the Tanforan Station or the Millbrae Avenue Station. Meters or parking zones would encourage turnover and make curb parking available to patrons of local businesses. Implementation of this measure would not have significant environmental effects.

Table 3.1-14
Locally Preferred Alternative
Estimated Station Parking Space Requirements
Horizon Year 2010

		Parking Supply	
BART Station	**Modeled Parking Demand (1)**	**Current Station Design**	**As Mitigated**
Daly City	1,880	1,740 (2)	1,740
Colma	2,360	3,030 (2)	3,030
Hickey	1,130	1,337 (3)	1,337
Tanforan	800	1,000 (3)	1,000
Millbrae Avenue	2,220	3,000 (3)	3,000
TOTAL	**8,390**	**10,107**	**10,107**

Source: Parsons Brinckerhoff, April1994

Notes:
1) MTC auto-access projections at BART stations were reallocated using the subarea traffic model
2) BART SFO AA/DEIS/DEIR March 1992, Table 4-24
3) Alignment Alternatives/Station Design Options, BART, April 19, 1994

24. *Some BART users of the Tanforan Station may find parking lots at the Tanforan Park Shopping Center more appealing than the Tanforan Station parking structure. (S)*

MITIGATION MEASURES. The following mitigation measure would reduce this impact to an insignificant level.

24.1 *Design Features and Signage.* The Tanforan BART Station parking structure will be designed close to the station entrance and incorporate clear signage and closed circuit television to discourage BART patrons from using the shopping center lots. Closed-circuit television will be utilized to monitor parking infractions and provide surveillance. Patrols will provide a safe environment for patrons and their vehicles.

25. *SFIA air passengers may use the parking lots at the Hickey, Tanforan, or Millbrae Avenue Stations to access the SFIA. (S)*

MITIGATION MEASURES. The following mitigation measures would discourage air passengers from using BART station parking facilities, reducing this impact to an insignificant level.

25.1 *Parking Restrictions.* The main parking lot will be controlled in the same manner as other BART parking lots where non-BART usage is prevalent. All parking patrons must buy a BART ticket and obtain a validated parking stub inside the paid area by entering their parking space number into the permit dispensing machine. BART can ticket or boot other vehicles, including vehicles that park overnight and do not obtain new validation. This system is currently in place at other BART stations. Restrictions on parking to 24 hours will prevent SFIA air passengers from using BART parking facilities, except for those who return less than 24 hours from departing.

25.2 *Pricing Surcharge or Other Administrative Mechanisms.* Pricing surcharges and other mechanisms would be developed to discourage SFIA air passengers from parking at BART stations. Trips from BART stations to the SFIA would be monitored to assess if patrons were parking at nearby BART stations to avoid parking charges at the SFIA. If it were determined that SFIA passengers were parking at stations near to the SFIA to avoid parking charges, a surcharge would be placed on short trips, or an equivalent mitigation would be implemented.

An example of equivalent mitigation is parking stall validation by BART customers who park and ride BART trains. Customers would insert their BART ticket into the parking validation machine which would be encoded with information that the customer has parked the vehicle at one of the BART extension stations and are subject to a substantial surcharge if exiting at the Airport International Terminal Station. This mitigation has technological and cost difficulties and would inconvenience all patrons using the parking validation machines at the Hickey, Tanforan, or Millbrae Avenue Stations.

Cumulative Analysis

No significant cumulative parking impacts are expected as a result of implementation of the Aerial Design Option LPA along with other known, foreseeable, or pending development projects. The only significant parking effect of the BART extension that could cumulate with other effects would be the use of BART parking lots to avoid charges at the SFIA garages and lots. This effect occurs only at the BART

stations. None of the other cumulative development projects (i.e., the SFIA Master Plan or the El Camino Corridor Redevelopment Project) would significantly intensify parking demand at BART facilities. The SFIA Master Plan would increase the number of public parking spaces at SFIA by 27 percent. While the SFIA Master Plan EIR still predicts a parking shortage for passengers in 2006 and could increase demand at BART parking facilities, the mitigation measures identified for the project-specific impacts would avoid this cumulative effect.

1.6 Pedestrian, Bicycle and Freight Impact Assessment and Mitigation

Significance Criteria

Impacts on pedestrian, bicycle, and freight transportation are considered significant when existing or planned facilities (e.g., sidewalks, bike paths, or freight rail lines) are precluded or removed, pedestrian volumes are sufficiently high to create overcrowded conditions on sidewalks and impede movement, or travel distances are increased beyond a reasonable length for a given mode (i.e., 0.5 mile for pedestrians and two miles for bicycles). Additionally, if the Aerial Design Option LPA conflicts with a bicycle policy or route, this inconsistency is noted.

Project-Specific Analysis

Pedestrian/Bicycle

26. *No legal pedestrian/bicycle crossings of the SPTCo would be affected by the Aerial Design Option LPA. Existing informal and unlawful pedestrian crossings of the SPTCo and CalTrain rights-of-way would be eliminated and dangerous conditions caused by illegal crossings would be eliminated. (I)*

    Loss of informal and unlawful SPTCo crossings is not considered a significant adverse impact of the Aerial Design Option LPA. Affected informal crossings are identified below:

    - The pedestrian/bicycle crossings serving El Camino High School and Kaiser Medical Center would be eliminated.
    - Four existing crossings between West Orange and South Spruce Avenue would be eliminated.
    - Between South Spruce Avenue and the Tanforan Park Shopping Center, the existing pedestrian/bicycle movement traversing the SPTCo San Bruno branch right-of-way at South Spruce Avenue would be retained, but informal crossings of the CalTrain tracks would be eliminated by the introduction of fences.
    - The at-grade segment in Millbrae would be fenced off and would eliminate pedestrian/bicycle crossings of SPTCo tracks between Center Street and Millbrae Avenue. A new formal crossing of the tracks would be created at Hillcrest Boulevard, which would be extended east of the tracks to provide access to the Bayside Manor neighborhood. Bicycles could be walked across the free area of the Millbrae Avenue Station mezzanine.

27. *BART allows bicycles on its trains during off-peak hours. Thus, the Aerial Design Option LPA would provide enhanced mobility for cyclists. (B)*

Table 3.1-15
Locally Preferred Alternative
Peak-Hour BART Station Pedestrian Entries and Exits 2010

Station	2010 Horizon Year
Daly City	332
Colma	356
Hickey	500
Tanforan	168
Airport International Terminal	1042
Millbrae Avenue	277

28. *Pedestrian volumes would increase around the proposed Aerial Design Option LPA stations compared to the No Build Alternative. The projected number of peak-hour station entries and exits would not be high enough to cause a significant impact on pedestrian activity. (I)*

As displayed in Table 3.1-15, pedestrian volumes at the Airport International Terminal Station are estimated at 1,042 pedestrians during the P.M. peak hour in 2010. At the Hickey, Tanforan, and Millbrae Avenue Stations, the volumes would be relatively low. These volumes would not impede existing pedestrian activity or contribute substantially to sidewalk congestion. The high volume at the Airport International Terminal Station would be accommodated by the terminal's design. There would be no negative impacts associated with these pedestrian volumes.

Freight

29. *The Aerial Design Option LPA would not impact rail freight service on the SPTCo San Bruno branch, since service on this segment was recently abandoned, or on the CalTrain right-of-way, since service would be maintained. (I)*

In the cities of South San Francisco, San Bruno, and Millbrae, rail freight service currently exists along the CalTrain right-of-way. Service along the San Bruno branch was abandoned by SPTCo, and this abandonment of the San Bruno branch would not result in identifiable environmental impacts. Freight service on the CalTrain mainline would not be adversely affected because the existing service would be maintained.

Cumulative Analysis

No significant cumulative impacts to pedestrian and bicyclist circulation or to freight service would occur with implementation of the Aerial Design Option LPA and other development projects in the project corridor. In both instances, the BART extension results either in insignificant or beneficial effects. Similarly, none of the other known projects (i.e., the SFIA Master Plan or the El Camino Corridor

Redevelopment Plan) would be expected to cause long-term disruption to pedestrian and bicyclist movement or to freight activity.

Section 2
Land Use and Economic Activity

2.1 Introduction

This section considers land use, economic activity, socioeconomic patterns, and relocation associated with the BART–San Francisco Airport Extension. The siting of a transit route and station in a community raises the potential for a variety of land use effects. On the positive side, a station can stimulate desired land development and foster economic activity. On the negative side, a station can require land acquisition, create development pressures on surrounding areas, or encourage a level of activity that conflicts with the nearby land uses.

Rail stations can enhance regional mobility by improving accessibility to local destinations such as employment centers, governmental, health, and educational facilities, recreational areas, and other high-use "activity centers." The benefits of improved accessibility are especially important for people who are "transit-dependent." These individuals are often youth, elderly, and lower-income people who may not be able to afford or use an automobile.

The purpose of this section is to describe the existing land use and socioeconomic conditions in the project corridor, where most land use effects would be experienced. Existing land use and socioeconomic conditions in San Mateo County that are relevant to regional impacts are also described. The section then considers how these conditions might change with the introduction of BART service. Three specific areas of land use impact are considered: compatibility with land use and economic development objectives of the local jurisdiction, land acquisition and displacement, and neighborhood or community cohesion. Impacts addressed in this section are those associated with operation of the Aerial Design Option LPA. Impacts directly related to construction activities are addressed later in Section 3.13, Construction.

2.2 Existing Conditions

Regional Summary

The project corridor is located in northern San Mateo County. As shown in Table 3.2-1, San Mateo County had a 1990 population of 649,623, an 11 percent increase from 1980; however, the overall 1980 to 1990 Bay Area growth rate in that time was 16.3 percent. San Mateo County had an increase of 18,582 housing units between 1980 and 1990, a growth of 8 percent, which, like the population growth rate, lagged behind the Bay Area rate of 14.7 percent.

More than half of the developed land in San Mateo County is devoted to residential uses. Commercial uses in San Mateo County (11 percent of land area) are generally concentrated in a narrow business strip that lies between El Camino Real and Highway 101. Industrial uses also occupy approximately 11 percent of the county's land area and are generally located in industrial parks. San Mateo County has more employed residents than jobs. The result is that 40 percent of employed San Mateo County residents commute to other counties for work.

Table 3.2-1
Selected 1990 Census Data for San Mateo County and Affected Cities

	San Mateo County	Colma	South San Francisco	San Bruno	Millbrae	Burlingame
DEMOGRAPHICS						
Population	649,623	1,091	54,312	38,961	20,412	26,801
Households (HH)	241,914	365	18,588	14,660	7,967	12,360
Average HH Size	2.64	2.68	2.90	2.58	2.52	2.13
Percent Black	5.4%	2.3%	3.9%	3.7%	1.0%	1.0%
Percent Asian	16.8%	23.3%	24.8%	18.0%	16.9%	8.8%
Percent Hispanic	17.6%	36.7%	27.4%	18.0%	10.9%	10.2%
Percent 65+ Years	12.3%	12.3%	11.2%	7.3%	19.7%	18.8%
Median HH Income	$46,437	$39,028	$42,920	$42,019	$45,999	$42,487
Percent Below Poverty	6.2%	6.2%	5.8%	4.6%	5.3%	4.7%
Percent Unemployed	3.0%	1.7%	3.7%	2.9%	2-0%	2.9%
HOUSING						
Vacancy Rate	3.9%	7.6%	2.9%	3.5%	2.8%	4.5%
Percent Owner Occupied	60.2%	53.4%	61.4%	62.5%	64.1%	45.5%
Median Value	$340,800	$231,300	$269,900	$291,800	$397,200	$461,800
Median Rent	$769	$647	$721	$763	$838	$726
Percent Overcrowding	9.2%	17.7%	12.2%	8.5%	5.2%	4.3%
Percent Detached	57.4%	61.1%	56.8%	59.8%	65.9%	51.3%
Percent >5 units	25.2%	19.1%	17.5%	26.8%	24.9%	13.4%
OCCUPATIONS						
Percent Managerial	31.5%	22.1%	21.5%	26.2%	30.1%	35.0%
Percent Technical	35.9%	34.5%	37.5%	37.1%	38.6%	39.4%
Percent Service	12.0%	14.8%	13.8%	12.2%	12.6%	10.0%
Percent Craft/Repair	9.8%	12.0%	12.0%	12.9%	9.6%	7.9%
Percent Operators/Laborers	9.2%	13.8%	14.4%	10.9%	8.2%	7.1%
TRAVEL						
Percent Transit-Dependent	NA	9.7%	7.3%	6.0%	6.4%	7.9%

Source: U.S. Census of 1990.

Table 3.2-2
Population and Employment Trends and Projections
Project Corridor Cities - 1990-2010

	Colma	South San Francisco	San Bruno	SFIA	Millbrae	Burlingame
POPULATION						
1990	1,091	54,312	38,961	N.A.	20,412	26,826
1995	1,400	57,800	40,900	N.A.	21,300	27,900
2000	1,600	59,400	41,200	N.A.	21,600	28,100
2010	1,900	62,050	41,500	N.A.	21,800	28,500
EMPLOYMENT						
1990	1,100	43,300	12,490	20,900	5,590	29,280
1995	1,100	46,870	12,500	23,800	5,700	29,300
2000	1,500	46,890	14,200	29,000	6,000	31,720
2010	1,600	49,400	16,800	29,100	6,200	33,080
SECTORS						
Manuf./Whol.	8.8%	33.4%	9.7%	N.A.	10.4%	20.2%
Retail	32.7%	13.6%	30.2%	N.A.	31.1%	17.1%
Services	25.2%	18.9%	22.8%	N.A.	44.7%	37.4%
Other	33.3%	34.1%	37.3%	N.A.	13.8%	24.6%

Source: U.S. Census; ABAG, Projections '92 and '94.
N.A. = Not applicable, as there are no residential or other employment uses on SFIA land.

Table 3.2-2 presents regional projections of population and employment trends for the project corridor cities. While Colma is projected to have the highest growth rate, its base population and employment are currently low. The SFIA, San Bruno, and South San Francisco are all expected to experience substantial employment increases.

Population, housing, and household statistics are drawn extensively from the 1990 census. The smallest geographic unit for census data is the "block." Block data include only population characteristics and are used in this section to present neighborhood population and ethnic composition. The smallest geographic unit for which housing data and household income are reported is the census tract, an aggregation of blocks typically larger than neighborhoods. Accordingly, housing and income characteristics reported for neighborhoods in this section are based on the census tract.

Colma

Policy Plans. Colma General Plan policies specify that the BART–San Francisco Airport Extension should travel below grade and be covered to avoid visual or noise impacts on the community, especially cemetery uses (Land Use Element, Policy 9 and Circulation Element, Policy 11).

Land Use Patterns. Colma is unique within the Bay Area: approximately 75 percent of its two square miles is devoted to cemetery and agricultural use; only 15 percent is allocated to commercial uses and less than 2 percent to residential uses.

The town was incorporated for the purpose of protecting cemeteries and related uses from urban encroachment. On the border with Daly City is Sterling Park, Colma's primary residential neighborhood, located east of El Camino Real and northeast of the SPTCo right-of-way. The primary commercial districts are located along Junipero Serra Boulevard and Serramonte Boulevard, and for the most part contain automobile dealerships and other retail uses. As shown in Figure 3.2-1, the project corridor runs along the SPTCo San Bruno branch, generally cutting across a succession of cemeteries.

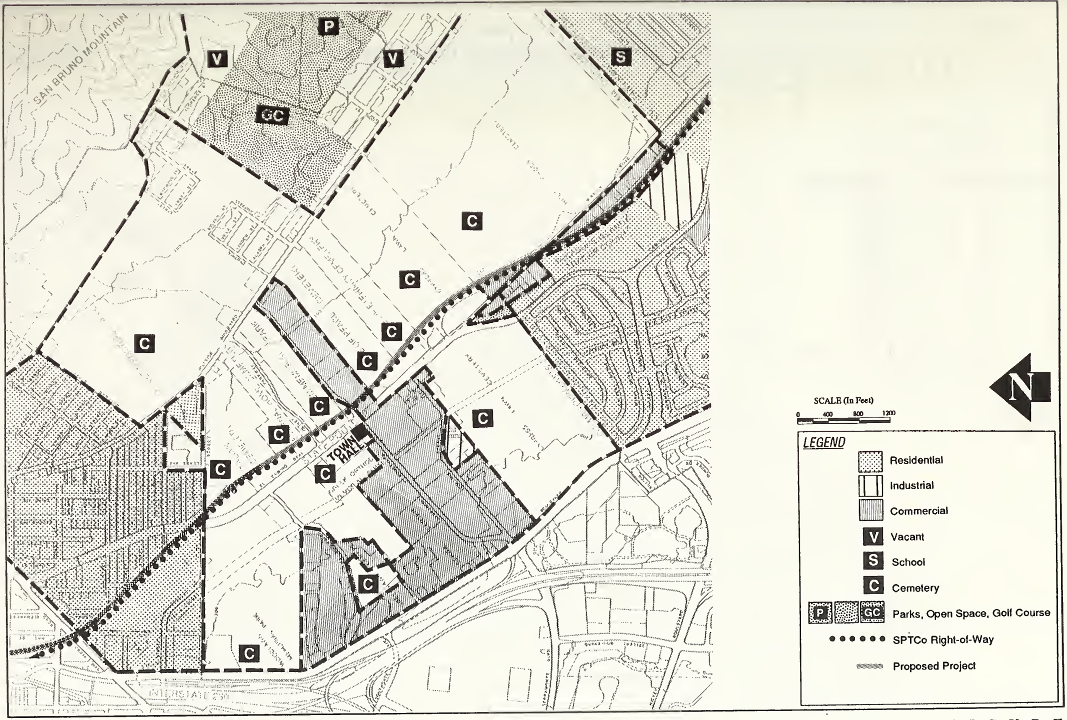
Socioeconomic Characteristics. According to the U.S. census, the 1990 population of Colma was 1,091, by far the smallest in the project corridor. The population includes a relatively high percentage of ethnic minorities (greater than 60 percent of the town's population). The median Colma household income in 1990 was $39,028, considerably below the San Mateo County median of $46,437 and the lowest of any city in the project corridor. The median value of homes was $231,300, almost 50 percent less than the county median. The median rent was also lower, at $647. Almost 10 percent of Colma households are transit-dependent, including 25 percent of those with an elderly head of household and approximately 6 percent of the non-elderly households.

South San Francisco

Policy Plans. In June 1993, the city council adopted General Plan Amendment GP-93-47, which created a new Planning Area 11 that coincides with the El Camino Corridor Redevelopment project area. General Plan Policy 11 and the *El Camino Corridor Redevelopment Area Plan* include provisions to encourage BART to traverse South San Francisco in subway, to design the BART station to minimize impacts to the community, and to encourage higher density, transit-oriented residential uses near the station.

Land Use Patterns. Much of the housing and industrial use in the city was developed between the 1940s and 1960s, and South San Francisco is currently fully developed. Notable vacant sites in the area east of Highway 101 include the 60-acre Shearwater commercial property and the 30-acre Koll property along the southern portion of Sierra Point. There are also approximately 60 vacant or underutilized acres in the northwestern section of the city where El Camino Real enters from Colma in close proximity to the proposed BART alignment. As shown in Figure 3.2-2, there are a diversity of land uses in the project corridor through South San Francisco. The figure shows only the generalized land use patterns along the project alignment. More specifically, the principal uses from north to south include:

- the Treasure Island Trailer Court;
- a large Macy's warehouse complex west of the right-of-way and north of a proposed extension of Hickey Boulevard that would join El Camino Real and Hillside Boulevard;
- the Kaiser Medical Center, clinic, and parking structure;
- the Municipal Services Building between Arroyo Drive and Westborough Boulevard;
- Orange Memorial Park between Chestnut Avenue and Orange Avenue and the Boys and Girls Club;
- Los Cerritos Elementary School, South San Francisco High School, and several single family neighborhoods between Orange Avenue and South Spruce Avenue; and



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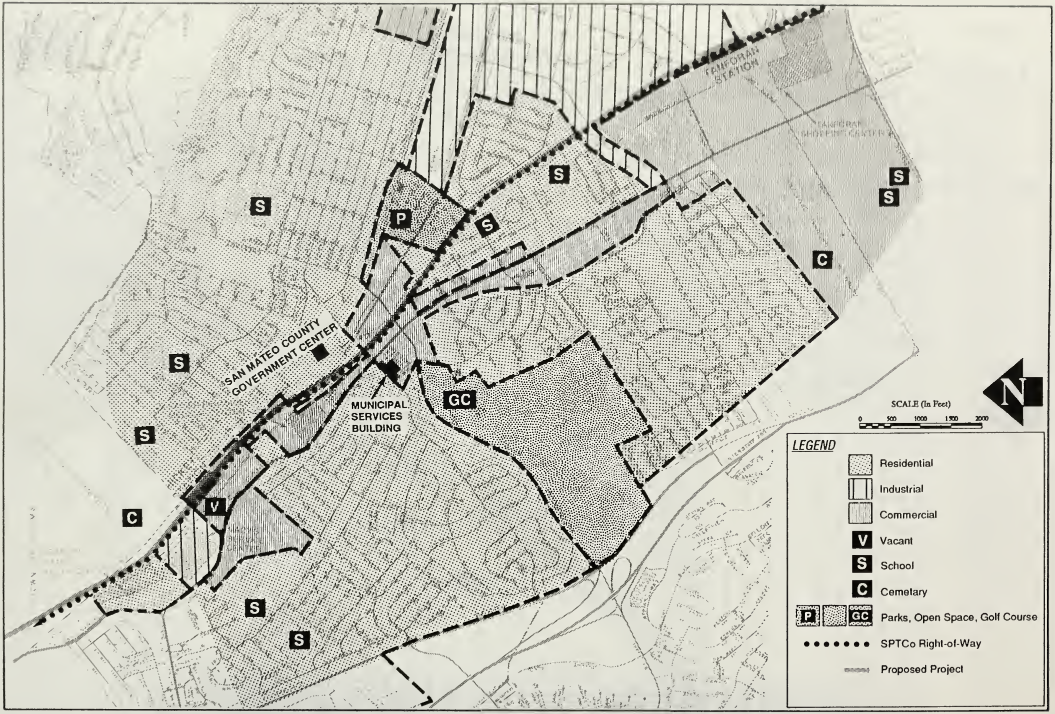
Colma Study Area
Land Use

FIGURE
3.2-1



OGDEN

South San Francisco Study Area
Land Use

FIGURE

3.2-2

- approaching the boundary of South San Francisco and San Bruno, industrial businesses east of the right-of-way and mixed uses along Huntington Avenue on the west.

Socioeconomic Characteristics. The 1990 census population of South San Francisco was 54,312, an increase of 9 percent since 1980. The population includes a high percentage of ethnic minorities (greater than 55 percent of the city population); median value of homes was $269,900, considerably below the San Mateo County median of $340,800; median rent at $721 was also lower than the county average. Almost 24 percent of households with an elderly head of household were transit dependent, while only 3 percent with non-elderly heads of household were transit-dependent.

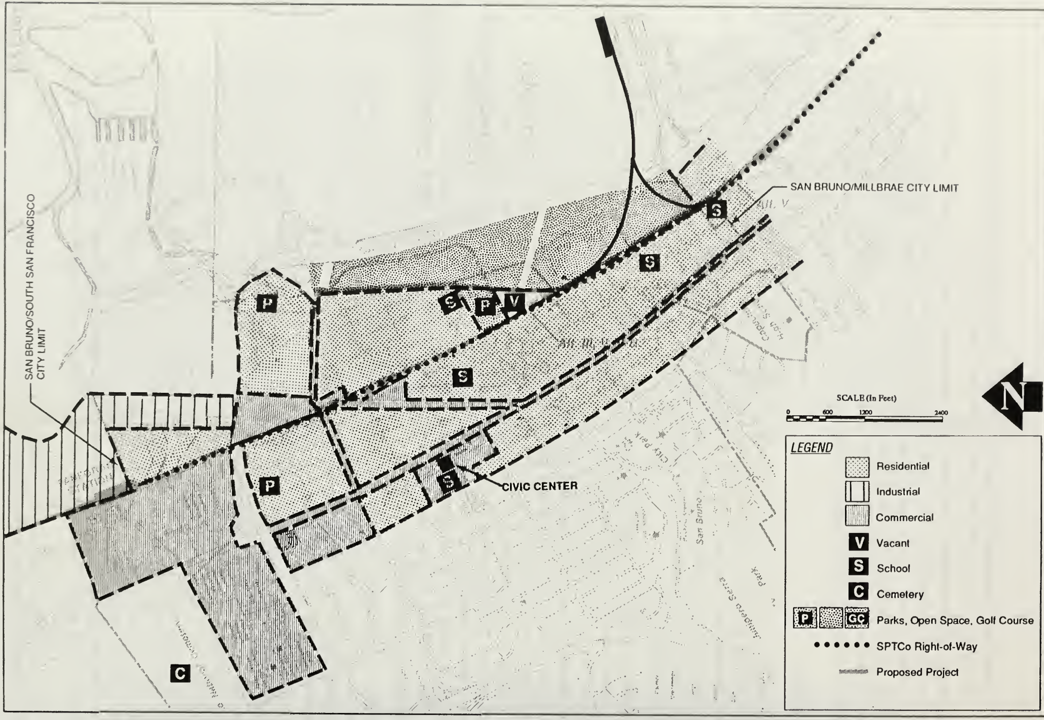
San Bruno

Policy Plans. In Circulation Element, Policy 8, the city's general plan supports extension of BART to the SFIA along the abandoned railroad right-of-way and construction of a BART station at Tanforan, if impacts are adequately mitigated. If BART is extended through San Bruno to the SFIA and/or a BART station is located in San Bruno, the BART route and station location design of facilities, parking, and offsite improvements should minimize negative impacts on existing development, particularly on residential neighborhoods.

Land Use Patterns. In San Bruno, the project corridor includes the length of Huntington and San Antonio Avenues (see Figure 3.2-3). North of I-380 and west of Huntington Avenue are Towne Center and Tanforan Park, large retail shopping centers. On the east side of Huntington Avenue is a small neighborhood of homes and multi-unit buildings, originally the Fifth Addition to the Belle Air subdivision. Bayshore Circle Park and the Herman Tot Lot are located in this residential area. According to the census, 75 percent of the units in the census tract encompassing this neighborhood are listed as single family, detached houses, and 56 percent are owner-occupied. The median house value for the census tract was $224,100. Based on census block data (which are more refined than tract data but only include population statistics), the population was 1 percent black, 31 percent Asian and Pacific Islander, 35 percent Hispanic, and 33 percent non-Hispanic white. The area east of the CalTrain tracks and south to I-380 is San Bruno's largest industrial area, consisting of automobile repair shops, small industrial buildings, long-term enclosed airport parking, and several houses.

Land uses in the vicinity of San Bruno and San Mateo Avenues encompass San Bruno's Central Business District and service commercial businesses, primarily automobile repair services. The block between Angus and San Mateo Avenues is anchored by Artichoke Joe's, a large card room and gaming facility that occupies much of the block.

South of I-380 to Millbrae, the project corridor in San Bruno is exclusively residential, except for the commercial area along San Mateo and San Bruno Avenues, the Armory, Lion's Field Park, and the community gardens. Belle Air Elementary School and an after-school childcare center are also located in this neighborhood. The area east of the CalTrain tracks and south to Lion's Field is known as the Belle Air neighborhood. Its population, based on census block data, is 21 percent Asian and 35 percent Hispanic, with an average household size of 3.17, well above the city median of 2.58. According to 1990 census tract data encompassing the Belle Air neighborhood, 75 percent of the housing units are single family, detached homes, and 56 percent of the total units are owner-occupied. The median reported house value in 1990 was $224,100, well below the city median of $291,800, as was the median rent of $680, compared to a citywide median of $763. Median household income for this census tract is similar to the city median, but the poverty rate, at 10.5 percent, is twice the city average. South and east



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San Bruno Study Area
Land Use

FIGURE 3.2-3

of this area is a large, vacant parcel in unincorporated San Mateo County, owned by the SFIA, which contains overhead PG&E high-voltage lines, electrical substations, and drainage canals.

Socioeconomic Characteristics. The 1990 census population of San Bruno was 38,961, a growth of approximately 10 percent since 1980. The median value of homes was $291,800, considerably below the San Mateo County median of $340,800. The median rent was $763, nearly the same as that for the county. Twenty percent of residents with a head of household 65 years of age or older were transit dependent, while only 3 percent with a non-elderly head of household were transit-dependent.

San Francisco International Airport

The project corridor at SFIA is bounded by I-380 to the north and Millbrae Avenue to the south, and includes a large parcel west of Highway 101 (also referred to as the west of Bayshore parcel) and the airport passenger terminal complex. SFIA covers approximately 5,200 acres, about 2,700 acres developed for airport use and 2,500 acres in undeveloped tidelands. SFIA property west of Highway 101 (about 180 acres) is undeveloped, while land uses east of the highway are characterized by airport support facilities such as airfreight, aircraft maintenance, aviation offices, and warehouses. According to the SFIA Master Plan FEIR (1992), about 33,400 person are employed at SFIA-related activities, including 6,500 flight-crew personnel directly due to operations at SFIA. The employment estimate includes jobs with governmental agencies, concessionaires, freight and ground transportation, and the hotels.

The SFIA is located in an unincorporated area of San Mateo County but is owned by the City and County of San Francisco, and therefore is not subject to the land use regulations of the County of San Mateo. In recognition of the impact of airport operations on adjacent communities, the state required the establishment of Airport Land Use Commissions (ALUC) to develop land use plans around airports. General plans and zoning of adjacent communities are required to be consistent with the Airport Land Use Plan (ALUP), as developed by ALUC.

A portion of the SFIA is within the sphere of influence of the City of San Bruno. The *San Bruno General Plan* and the SFIA Master Plan both designate the SFIA as an industrial land use, except for the 180-acre SFIA west of Bayshore parcel. This area contains habitats for sensitive wildlife species and is not analyzed for development under the SFIA Master Plan EIR, pending a habitat conservation study and specific permit(s) from the California Department of Fish and Game and the U.S. Fish and Wildlife Service.

The SFIA Master Plan is meant to provide the basis for implementing changes in the use of all SFIA-owned landside facilities to improve the efficiency and cost effectiveness of SFIA operations. The master plan does not contain policies, but does include near-term and long-term recommendations for changes in the use of SFIA-owned land and facilities. The near-term plan for 1990-1996, among other projects, includes development of the ALRS, the Ground Transportation Center, and the International Terminal. All improvements are proposed for SFIA property east of Highway 101. The long-term plan, covering improvements beyond 1996, includes, among other projects, cargo and commercial facilities, parking lot expansion, as well as potential future extension of the ALRS to mass transit.

Millbrae

Policy Plans. Millbrae's 1991 Draft General Plan contains the following policies relevant to BART:

- If BART is extended to and beyond the airport, noise impacts should be assessed and mitigated (Noise Element).
- Encourage BART extension to the airport to go to the airport terminal (Circulation Element, Policy 11).
- If BART extension is west of Bayshore Freeway, within or near Millbrae, ensure identification and mitigation of all adverse impacts on existing development (Circulation Element, Policy 12).
- Coordinate and cooperate with and monitor plans of other agencies such as San Mateo County, MTC, SFIA, BART, and SamTrans (Circulation Element, Policy 13).

Land Use Patterns. The project corridor in Millbrae is located between El Camino Real and Highway 101 (see Figure 3.2-4). Marino Vista, North Millbrae, and Bayside Manor neighborhoods are located between the CalTrain tracks and Highway 101. Adjacent to these subdivisions is vacant SFIA property in unincorporated San Mateo County. Lomita Park Elementary School is adjacent to the CalTrain tracks in the Airport Park neighborhood, between the tracks and El Camino Real. South of Bayside Manor, Millbrae Gardens consists of approximately 200 multi-family units in 21 buildings.

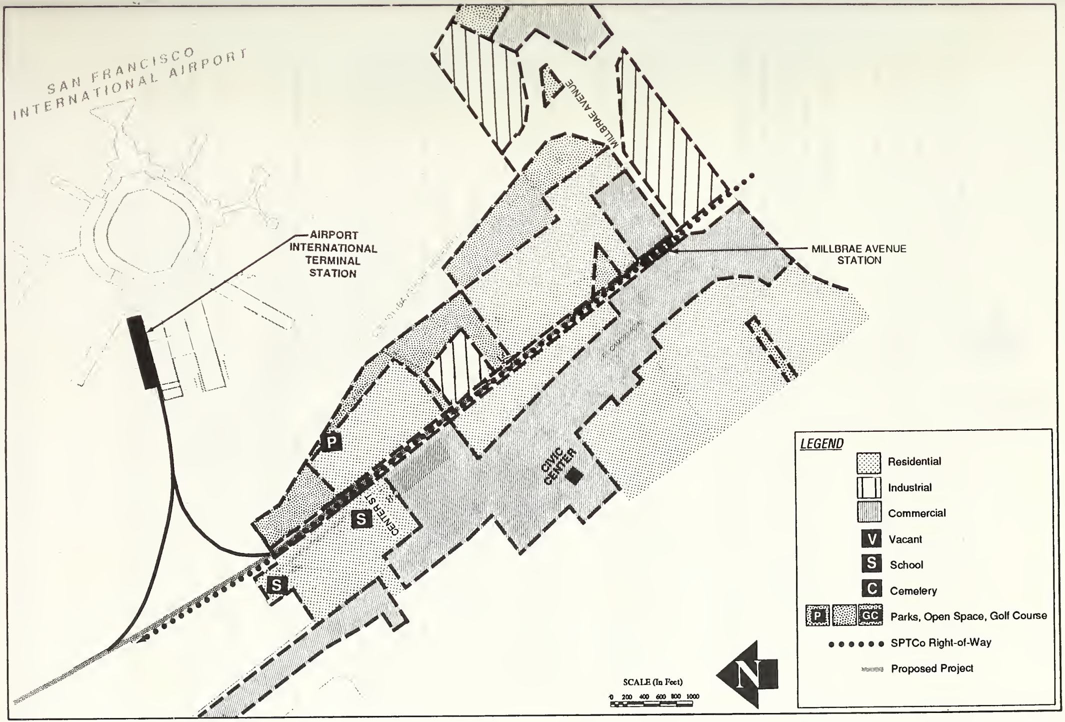
Socioeconomic Characteristics. According to the 1990 census, the population of Millbrae was 20,412, a growth rate of less than 2 percent since 1980. The population was 17 percent Asian, 1 percent black, 11 percent Hispanic, and 64 percent white. Twenty percent of the population was 65 years of age or older, much higher than the 12 percent elderly rate for the county. The median value of homes was $397,200, 16 percent higher than the San Mateo County median of $340,800. Only 2.8 percent of households occupied by non-elderly residents in Millbrae were transit dependent; the proportion of transit-dependent among elderly households was 14.5 percent.

Burlingame

Policy Plans. The Burlingame General Plan was adopted on October 20, 1969 by resolution 87-69 and last amended in 1994 with the Housing Element. The General Goals and Implementing Objectives that pertain to BART include:

> An integrated system of regional rapid transit and local transit should be developed to serve Burlingame residents and workers and to provide for the high volume through-movement that must be accommodated in this corridor in the future. The rapid transit line should be completely grade separated, designed to minimize noise, prevent adverse visual impact on the community, and have sufficient grade separated local street crossings to keep the line from being a barrier.
>
> In implementing the recently adopted 1990-97 Housing Element, the City of Burlingame created an overlay zone allowing high density residential development along the west of California Drive from the back of single family lots facing Dufferin to the Millbrae/Burlingame city line at Magnolia.

Land Use Patterns. The project corridor in Burlingame consists of the northern 1,500 feet of the city between Rollins Road and El Camino Real. The CalTrain right-of-way divides the area into distinct land use districts. Northeast of the right-of-way is an industrial park with a mix of one- and two-story concrete buildings, divided between office and industrial uses, including storage, fabrication, and production facilities.



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Millbrae Study Area
Land Use

FIGURE 3.2-4

The block between Murchison Drive, El Camino Real, Trousdale Drive, and California Drive contains a variety of commercial uses and a three-story nursing home. A congregate care facility has been recently constructed at 1733 California Drive between Trousdale Drive and Dufferin. West of El Camino Real are the Burlingame Plaza shopping center and Peninsula Hospital and ancillary uses. The closest residential areas are several blocks of multi-family housing on Trousdale Drive, Ogden Drive, and Sequoia Avenue. Figure 3.2-5 illustrates land use patterns in the project vicinity.

Socioeconomic Characteristics. According to the 1990 census, Burlingame had a population of 26,801, which represented a growth rate of 2 percent since 1980. Much of Burlingame's housing was developed in the first half of the century. Like Millbrae, its residents are older than the county average, with almost 19 percent of the population 65 years or older, compared to 12 percent for the county. The median value of homes in 1990 was $461,800, 35 percent above the San Mateo County median. According to the 1990 census, the city population was predominantly white.

BART

Because of BART's ability to affect local development patterns, a short discussion regarding BART's land development policy is provided. BART's policy regarding local land development, as reflected in District Resolution No. 2837 (Station Area Development Implementation Policy), includes the following statement:

> The [BART] District shall work cooperatively with local jurisdictions, redevelopment agencies, developers, and other public and private sector entities to promote land use policies which encourage intensive, high-quality development on and surrounding station properties (General Policy #1).

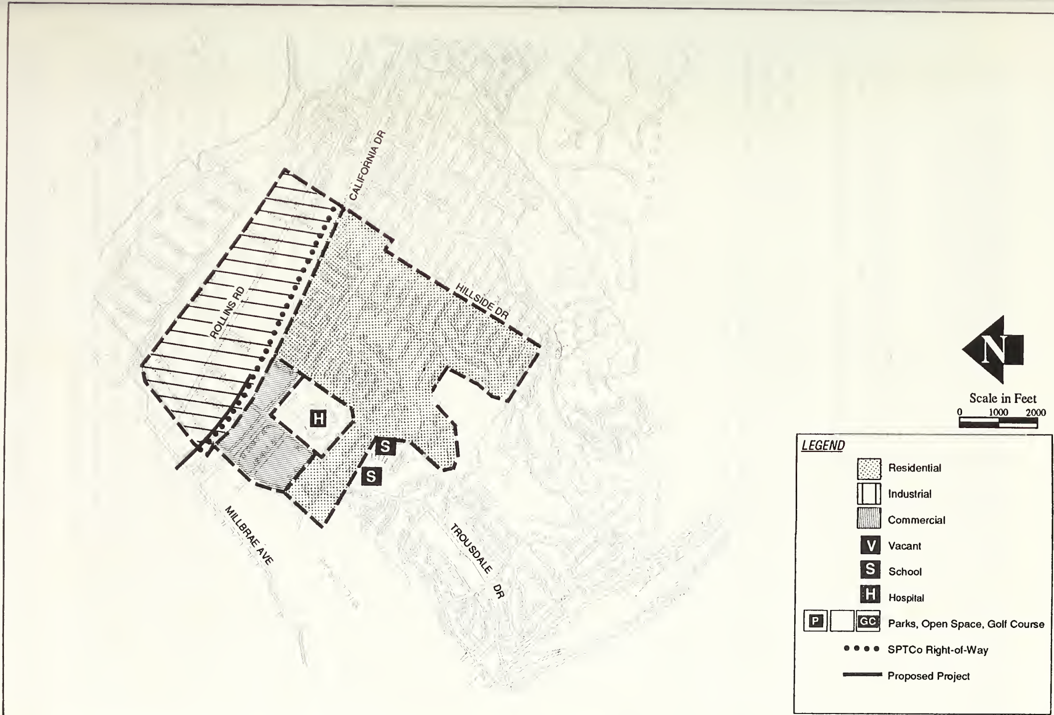
Such development can occur only when the local jurisdiction also supports the concept.

A primary objective of joint development is to encourage relatively dense development at and near station sites, which increases ridership and is compatible with local agency development plans. An example of this is the *El Camino Corridor Redevelopment Plan*, prepared by South San Francisco to foster more intensive development around the Hickey Station. Joint development options can include commercial, retail, or residential development. There are currently no specific proposals for joint development at any of the BART stations along the proposed extension.

2.3 Land Use/Economic Activity Impact Assessment and Mitigation

Significance Criteria and Methodology

Significance Criteria. In the following analysis, an impact is considered significant if it would impede or detract from efforts to economically revitalize areas within a given jurisdiction or conflict with current land uses. An increase in employment opportunities and/or permanent jobs is considered a beneficial impact, as is improved regional mobility and transit access to regional activity centers.



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Burlingame Study Area
Land Use

FIGURE 3.2-5

According to state law, BART is not required to comply with local plans and policies; therefore, designations of significance are not made in terms of the project's consistency with local general plans, and mitigation is not suggested if the project is inconsistent with local policies. BART nevertheless wishes to disclose to the public and to local jurisdictions the extent to which the BART extension is consistent with adopted local general plans and land use goals.

Methodology. The methodology followed to perform this assessment involved review of planning policies for the affected communities, assessment of development patterns in the communities and in other communities along the existing BART system, and interviews with knowledgeable officials in the communities.

There are currently no specific proposals for joint development at any of the station sites. Therefore, any analysis of potential environmental impacts would be highly speculative. If, in the future, a defined joint development project is proposed, it will be required to comply with local ordinances and permitting requirements as well as to undergo appropriate environmental analysis and review.

Project-Specific Analysis

Colma

1. *The proposed BART subway alignment of the Aerial Design Option LPA would be consistent with the town's general plan policies, particularly Land Use Policy 9 and Circulation Policy 1, which call for undergrounding the system to protect Colma's greenbelt theme.*

2. *Because the majority of the Town of Colma is built out, the Aerial Design Option LPA would result in limited economic activity in Colma and minimal, if any, land use conflict. Opportunities for land use/economic revitalization are limited and would be expected to occur around the Colma Station, which opened in February 1996. (I)*

South San Francisco

3. *Since the Aerial Design Option LPA alignment would traverse South San Francisco in a subway configuration, it is consistent with General Plan Amendment GP-93-47 and the El Camino Corridor Redevelopment Plan, Policy 11.*

4. *The proposed Hickey Station would potentially generate station-related development on nearby vacant or underutilized parcels, which would help fulfill the El Camino Corridor Redevelopment Plan and general plan amendment, which anticipate intensification of residential use in the station vicinity and higher densities. (B)*

   The *El Camino Corridor Redevelopment Area Plan* and the general plan amendment anticipate intensification of residential use in the station vicinity and allow higher densities of development if BART is built in a subway alignment. The general plan amendment, already adopted by the city, rezones sites to potentially allow up to 1,000 more housing units than would be permitted in the absence of the Hickey Station. Thus, the city has already planned for additional housing around the Hickey Station. The conceptual plan for the station supports these proposals by designating a site along the future Hickey Boulevard extension for possible commercial development and helps create the market for higher intensity residential development.

5. *The proposed Tanforan Station in San Bruno is not expected to impact existing industrial and commercial uses in South San Francisco; there is little vacant land in the vicinity to accommodate new development and the existing development is fairly stable. (I)*

San Bruno

6. *The Aerial Design Option LPA alignment and Tanforan Station location are consistent with San Bruno planning policies, particularly Circulation Element Policy 8.*

7. *Integration of the Tanforan Station with the Tanforan Park Shopping Center supports economic development at the shopping center and undergrounding of the station would avoid land use conflicts with the Fifth Addition neighborhood. (B)*

   Land uses in the vicinity of the proposed Tanforan Station are generally built out, with few opportunities for intensification or redevelopment. However, with the station shifting west from its earlier location under Alternative VI along the CalTrain tracks to within the Tanforan Park Shopping Center, transit access to the shopping center could enhance pedestrian flow and foster revitalization/market efforts at the shopping center. Furthermore, the shift in the alignment and station westward, plus their construction underground (as opposed to retained cut under the Alternative VI LPA) would reduce the airborne noise and visual effects on the Fifth Addition residents to the east.

Aerial Wye-Stub to the SFIA

8. *The Aerial Design Option LPA aerial alignment from San Bruno to the SFIA and from the SFIA to Millbrae would require acquisition of right-of-way but would not involve any displacement of existing structures or uses. (I)*

   The aerial wye-stub would pass over vacant SFIA land west of Highway 101 and over roads and surface parking lots east of Highway 101. The area east of Highway 101 through which the BART alignment would traverse is a narrow corridor with airfreight, nonterminal aviation support, and aircraft maintenance to the north (these are lands leased to United Airlines) and airport support to the south (these are lands leased to Hertz, Dollar, Budget, and Avis rental car agencies). The Airport International Terminal Station would not require displacement of existing uses. Accordingly, the effects of purchasing the necessary right-of-way for the Aerial Design Option LPA would not be significant.

9. *The aerial Airport International Terminal Station would affect improvements proposed as part of the SFIA Master Plan. (I)*

   The Aerial Design Option LPA would site an aerial station on the east side of Highway 101 in the vicinity of the planned International Terminal and Ground Transportation Center/Rental Car Garage (GTC/RCG). The SFIA Master Plan does not provide for a BART station on the east side of Highway 101; thus, the BART proposal under the Aerial Design Option LPA could affect implementation of the SFIA Master Plan. The 1989 SFIA Master Plan outlines a number of infrastructure improvements to be implemented by the year 2006 to accommodate projected growth at the airport. Key SFIA improvements that could be affected by the Aerial Design Option LPA east of the western edge of Highway 101 include the construction of an International Terminal, the GTC/RCG, the ALRS, and new highway ramps into and out of the airport.

Long-term effects would not be expected, however, since BART and the SFIA are working cooperatively to accommodate the BART alignment and station. A BART station at SFIA would not be incompatible with the proposed SFIA improvements, which are all transportation-related facilities. The schedule for implementation of SFIA projects would not necessarily be adversely affected by introduction of BART service. The SFIA Master Plan schedule could be maintained through the use of standard contracting practices during construction, e.g., conventional bid addenda, change orders, and construction block outs. By integrating the design of the BART guideway and station structures east of Highway 101 with those of the ALRS, the functional and operational impacts to the SFIA Master Plan would be minimized. Construction of the BART aerial guideway to coincide with SFIA's new freeway ramps would further minimize impacts.

The Airport International Terminal Station would be constructed immediately west of the planned International Terminal, so that BART operations would not adversely affect the International Terminal. Nevertheless, minor alignment shifts to the design of the ALRS would be required to integrate the structural support for BART platforms and the ALRS station at the GTC/RCG. Plans for the RCG may change as the SFIA staff reassesses the function and capacity of this facility.

Finally, the aerial guideway would be adjacent to a proposed new office and five-level parking structure on existing lots C and CC, immediately west of the proposed GTC. Construction of the office and parking structure is part of the long-term plan targeted for 2006. Neither of these uses would be incompatible or expected to conflict with aerial BART service.

Millbrae

10. *The proposed layout of the Millbrae Avenue Station is consistent with the Millbrae Avenue Station Area Concept Plan adopted by the City of Millbrae and supports the city's efforts to encourage future joint use and economic development opportunities around the station.*

    One of the city's objectives in adopting the concept plan was to stimulate economic development opportunities around the station. The station design has been modified in response to the city's plan and therefore supports the city's land use and economic objectives.

11. *The location of a station at Millbrae Avenue would be inconsistent with the Millbrae Land Use Element Policy 4, which calls for preserving the character of existing residential neighborhoods.*

    Removing approximately 200 dwelling units for the Millbrae Avenue Station and siting the station adjacent to a residential area, the Bayside Manor neighborhood, would be inconsistent with city policy.

12. *The Millbrae Avenue Station may adversely affect economic activity and municipal and school tax revenues in Millbrae. (S)*

    Although the number of businesses and jobs lost as a result of the proposed Millbrae Avenue Station would not be large, one of the displaced businesses (Hertz Used Car Sales) generates a considerable amount of sales tax revenue for the city. The loss of approximately 200 households would result in an indirect reduction in tax revenues and income from Millbrae businesses. In addition, the Millbrae School District would lose approximately 90 students from Spring Valley Elementary School and Taylor Middle School, resulting in the direct loss of more than $300,000 in

annual average daily attendance (ADA) and potentially an equivalent amount if the loss of property tax base changes the district from its status as a "Basic Aid" district.

MITIGATION MEASURES. Pursuant to federal and state requirements, BART/SamTrans would provide displaced firms and households with technical and financial assistance to relocate. Under certain circumstances, businesses and non-profit organizations would also qualify for loss of goodwill payments. Despite these requirements, unless the majority of relocation could be accommodated within Millbrae, this impact would remain significant. There is little existing comparable rental housing in Millbrae, so it would be difficult to mitigate the school district's financial problem. BART/SamTrans would address demonstrable loss of income to school districts in accordance with state and federal laws as applicable to non-profit organizations and public agencies. Providing replacement of lost revenues to school districts is, however, a state education and local funding issue separate from BART/SamTrans obligations, as defined under relocation assistance laws.

Burlingame

13. *The proposed BART turnback/tailtrack in Burlingame would be consistent with the general plan policies of the city.*

14. *Since no station is proposed in Burlingame and the majority of the city is built out, the project would be unlikely to have a significant economic impact in Burlingame. There may, however, be a limited opportunity for land use intensification within the industrial or commercial areas of northern Burlingame, which would be within walking distance of the Millbrae Avenue Station. (I)*

Project Corridor

15. *The BART mainline and auxiliary track would require the acquisition of right-of-way but would not involve any displacement of structures or existing uses. (I)*

    The BART mainline and auxiliary track would require the acquisition of land from the JPB, the SFIA, and San Francisco Water District, along the existing CalTrain mainline. No existing uses or structures would be displaced, unless noted in the next section on land acquisition, so that overall the impacts of this land acquisition would be insignificant.

16. *The Aerial Design Option LPA would result in employment opportunities in the project area, including 300 to 500 permanent jobs with the transit systems in the corridor, and additional indirect employment. (B)*

Cumulative Analysis

According to ABAG forecasts, which provide the basis for local and regional agency improvements, additional population and employment growth is expected in the corridor. Transit improvements would increase the probability that the anticipated level of development would occur. As noted for the proposed project, the likely cumulative effect of a BART extension would be to redistribute this projected growth around BART stations. Project-specific impacts include displacement of residences and businesses, resulting in loss of economic activity and revenues. Cumulative projects with a potential to impact land use in conjunction with the Aerial Design Option LPA include the SFIA Master Plan, the *El Camino*

Corridor Redevelopment Plan, and general growth projected in *ABAG's Projection '94*. However, none of these known, pending, or foreseeable projects would result in similar effects for the areas of study. Such displacements could potentially occur with the addition of other background development in San Bruno and Millbrae, but because the ABAG forecasts show increasing residential and job development, this scenario is unlikely. Accordingly, while there will be project-specific land use/economic impacts, significant cumulative effects are not expected.

2.4 Acquisition and Displacement Impact Assessment and Mitigation

Significance Criteria and Methodology

Significance Criteria. Implementation of the project would cause a significant impact if it displaced residents, businesses, parks, or other land uses. The loss of low-cost housing units is particularly critical because of the populations it affects (lower income households) and the difficulty of achieving satisfactory mitigation. Section 104(d) of the Housing and Community Development Act of 1974 (as amended in 1988) defines a low- or moderate-cost unit as one with a market rent, including an allowance for tenant-paid utilities, that is equal to or less than the "fair market rents" for the federal Section 8 certificate program.

Methodology. Data regarding acquisition and displacement associated with the proposed project were abstracted from the September 1991 *Social & Physical Impacts and Mitigation Report* and the March 1992 AA/DEIS/DEIR. This information was supplemented by fieldwork as part of the DEIR/SDEIS. Staff in the cities of San Bruno, Millbrae, and Burlingame provided information on land use in those cities affected by the BART extension. Assessors' maps were analyzed in order to determine the types of structures and the number of units and buildings that might be demolished, and to estimate the number of businesses and employees that would be relocated. Given the conceptual nature of the current plans, profiles, and station layouts, these estimates are only approximate.

County officials were consulted regarding the low-income housing stock. Relocation experts from the City of Oakland, the California Department of Housing and Community Development, and the U.S. Department of Housing and Urban Development were consulted for current information about relocation laws and regulations. Census data on the population and housing stock in the corridor were also analyzed, as well as data in other county and city documents.

The acquisition and displacement analysis focuses principally on the station areas, where most of the relocation would occur. The BART–San Francisco Airport Extension would require land acquisition in or near the existing railroad right-of-way, but in most cases this acquisition would not displace any land use activity. This type of non-station-related acquisition is not discussed in detail. In order to estimate the number of residents affected, the number of units was multiplied by the average household size for each community, according to the 1990 census. The number of employees who would be displaced was estimated by use of field visual surveys and accepted square footage ratios for certain types of uses.

Since selection of the Aerial Design Option LPA in November 1995, BART and SamTrans have performed a more detailed investigation of displacement . The results of this study verify the estimates of displacement made in the DEIR/SDEIS and the FRDEIR/S#2DEIS. The residential estimate was exactly the same as the surveyed number (208 units); the non-residential estimate (ten) was several businesses

lower than the surveyed number (14) because several businesses were identified as being operated from within residences. The complete study, known as the Final Relocation Plan, is included in Volume V of this FEIR/FEIS.

It should be noted that BART/SamTrans or its agents are responsible for land acquisition, and title would be held by SamTrans. BART cannot acquire real property for the BART–San Francisco Airport Extension, because the area is not in BART's jurisdiction. BART is, however, designated by Caltrans as a public agency qualified to certify federal and state-funded transit projects. BART will maintain oversight responsibility and provide assistance to SamTrans in its acquisition and relocation activities.

This section of the analysis discusses acquisition and displacement impacts only. Economic impacts due to displacement are discussed in the previous section, Land Use/Economic Activity Impact Assessment and Mitigation, and social impacts are discussed in the following section, Neighborhood Impact Assessment and Mitigation.

Project-Specific Analysis

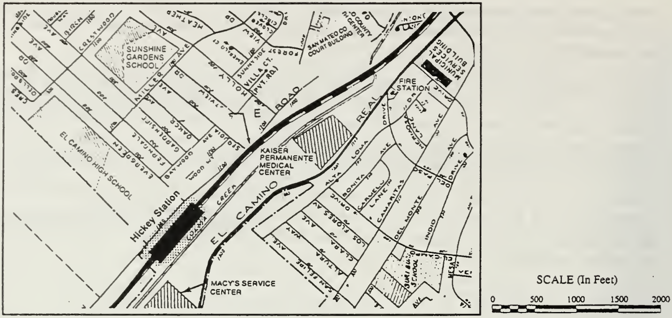
Colma

1. *The Aerial Design Option LPA would pass through Colma in subway along the SPTCo railroad right-of-way. The SPTCo right-of-way is not wide enough to accommodate the alignment in portions of Colma, so that in addition to acquiring the SPTCo right-of-way, there would also be land that BART/SamTrans would need to acquire from cemeteries and private land owners in the Town of Colma. Since no people or land uses would be displaced on these properties, this impact is considered insignificant. (I)*

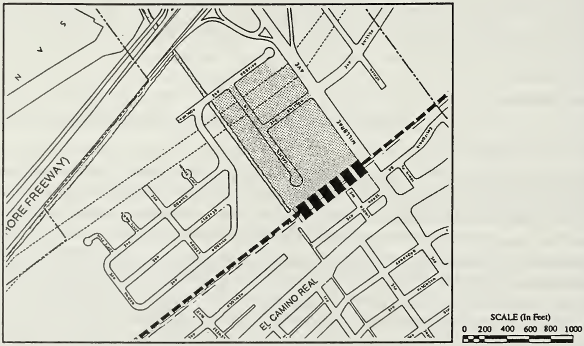
South San Francisco

2. *The Hickey Station would displace four businesses and two residences (see Figure 3.2-6 for the general area of effect). (S)*

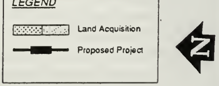
   MITIGATION MEASURES. The federal Uniform Relocation Act (Public Law 91-646) and the California Relocation Act (Chapter 16, Section 7260 *et. seq.* of the Government Code) and related laws and regulations contain specific requirements that govern both land acquisition and relocation. Under these laws, BART/SamTrans developed a Final Relocation Plan (FRP) to minimize impacts on businesses and households that would be displaced by the project. A copy of the complete FRP can be found in Volume V, Technical Appendices of this FEIR/FEIS. The plan assesses relocation needs and concludes that within the relocation areas specifically preferred by displaced residences (i.e., the County excluding the coastal communities East Palo Alto, Foster City, and the Redwood Shores area) there is sufficient housing stock to accommodate displaced households. The FRP also describes the relocation information, assistance, and payments that will be available to displaced property owners and tenants. Minimum relocation payments are detailed in the laws and include moving expenses and housing cost supplements for households and moving and search payments for businesses. Relocation assistance programs include, at a minimum, referrals to replacement housing within the means of the households and to comparable locations for the businesses. For purposes of the relocation act, parking lots are considered businesses. BART/SamTrans staff have conducted community workshops and open houses in South San Francisco, San Bruno, and



South San Francisco



Millbrae



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General Areas of Land Acquisition

FIGURE 3.2-6

Millbrae to discuss details regarding property owners' questions and rights pertaining to acquisition of property and relocation of property owners and tenants in accordance with federal and state relocation law. Real estate workshops will be held in communities and neighborhoods that would be directly affected by the project.

Nevertheless, residents and businesses may have a difficult time adjusting to relocation. Social patterns of shopping, circulation, and neighborhood activities would be altered and may be difficult to reestablish. Thus, it may not be possible to mitigate these social effects of relocation because there are no feasible mitigation measures (see further discussion in Section 2.5, Neighborhood Impact Assessment and Mitigation).

3. *The alignment between South Spruce Avenue and the Tanforan Station would require a right-of-way wider than the SPTCo land. Land belonging to the City and County of San Francisco along the west side of the alignment would be acquired. This acquisition would displace three businesses. One of the displaced businesses would be replaced with BART's proposed cash handling facility. (S)*

MITIGATION MEASURES. Compliance with acquisition and relocation laws, as described under Impact 2 above, would reduce the economic impact to an insignificant level. Nevertheless, residents and businesses may have a difficult time adjusting to relocation. Social patterns of shopping, circulation, and neighborhood activities would be altered and may be difficult to reestablish. Thus, it may not be possible to mitigate these social effects of relocation because there are no feasible mitigation measures (see further discussion in Section 2.5, Neighborhood Impact Assessment and Mitigation).

San Bruno

4. *Approximately two San Bruno businesses with a total of five to ten employees, located in the SPTCo right-of-way just north of San Bruno Avenue, would be displaced by the new track alignment. (S)*

MITIGATION MEASURES. Compliance with acquisition and relocation laws, as described under Impact 2 above, would reduce the economic impact to an insignificant level. Nevertheless, residents and businesses may have a difficult time adjusting to relocation. Social patterns of shopping, circulation, and neighborhood activities would be altered and may be difficult to reestablish. Thus, it may not be possible to mitigate these social effects of relocation because there are no feasible mitigation measures (see further discussion in Section 2.5, Neighborhood Impact Assessment and Mitigation).

Aerial Wye-Stub to the SFIA

5. *The BART aerial alignment from San Bruno to the SFIA and from the SFIA to Millbrae would require acquisition of right-of-way but would not involve any displacement of existing structures or uses. (I)*

The aerial wye-stub would pass over vacant SFIA land west of Highway 101 and over roads and surface parking lots east of Highway 101. The area east of Highway 101 through which the BART "trace" would traverse is a narrow corridor with airfreight, nonterminal aviation support, and aircraft maintenance to the north (these are lands leased to United Airlines) and airport support to

the south (these are lands leased to Hertz, Dollar, Budget, and Avis rental car agencies). The Airport International Terminal Station location would not involve the displacement of existing uses. Accordingly, the effects of purchasing the necessary right-of-way for the project would not be significant.

Millbrae

6. *The construction of the Millbrae Avenue Station would displace 202 units of multi-family housing at Millbrae Gardens and two businesses with 20 to 25 employees (see Figure 3.2-6). (S)*

   The Millbrae Avenue Station layout would require acquisition of 202 units of multi-family rental residential units and the Hertz rental car lot on Millbrae Avenue, resulting in the displacement of 10 to 15 employees. The proposed extension of a road from the Millbrae Avenue Station garage to Adrian Road would also require partial acquisition of two lots occupied by warehousing businesses, affecting 10,000 square feet and 5 to 10 employees.

   MITIGATION MEASURES. Compliance with acquisition and relocation laws, as described under Impact 2 above, would reduce the economic impact to an insignificant level. Nevertheless, residents and businesses may have a difficult time adjusting to relocation. Social patterns of shopping, circulation, and neighborhood activities would be altered and may be difficult to reestablish. Thus, it may not be possible to mitigate these social effects of relocation because there are no feasible mitigation measures (see further discussion in Section 2.5, Neighborhood Impact Assessment and Mitigation).

7. *The widening and extension of Hillcrest Boulevard from Hemlock Avenue under the CalTrain tracks to Aviador Avenue would result in the displacement of four single family homes. (S)*

   MITIGATION MEASURES. Compliance with acquisition and relocation laws, as described under Impact 2 above, would reduce the economic impact to an insignificant level. Nevertheless, residents and businesses may have a difficult time adjusting to relocation. Social patterns of shopping, circulation, and neighborhood activities would be altered and may be difficult to reestablish. Thus, it may not be possible to mitigate these social effects of relocation because there are no feasible mitigation measures (see further discussion in Section 2.5, Neighborhood Impact Assessment and Mitigation).

Low-Cost Housing

8. *The Aerial Design Option LPA could reduce the supply of low-cost housing in the City of Millbrae and San Mateo County. (S)*

   For Millbrae, the proposed project would result in a significant reduction in the rental housing stock. A total of 206 units would be displaced, of which 98 percent are multi-family rental units. The loss would represent 2.5 percent of the city's total housing stock, but 7.2 percent of the renter-occupied housing and 10.2 percent of the housing units in buildings with more than five units. The median rent in 1990 for the census block where these units are located was only $687, compared to the citywide median rent of $838.

   This reduction in the supply of affordable housing in the county under the Aerial Design Option LPA could put even greater pressures on housing availability and the lower income population.

The percentage reduction of the affordable housing stock resulting from this alternative is considered to be a significant impact.

MITIGATION MEASURES. Compliance by BART/SamTrans with all state and federal relocation laws designed to address problems resulting from reduction in the low-cost housing stock, as described for Impact 2 above, would find replacement housing for displaced households. Nevertheless, the city's low-cost housing stock would not be replaced, and this effect would remain significant and unavoidable.

Cumulative Analysis

There is no comprehensive analysis of acquisition and displacement for all potential projects in northern San Mateo County. Potential relocation is associated with implementation of the *Draft Colma Station Area Specific Plan,* the *El Camino Corridor Redevelopment Area Plan,* the Hickey Boulevard extension, and the Millbrae Avenue grade separation. The El Camino Corridor project would affect nine units and several sites with commercial and light industrial activities. The grade separation involves the relocation of two properties: a gas station and a small concrete batch plant. In addition, the implementation of the SFIA Master Plan would result in displacement of some existing airport-related uses at the SFIA. Cumulative impacts on households and businesses would occur in South San Francisco, where BART and the El Camino Corridor redevelopment activities would reduce the housing stock and businesses. The effects of the other plans and projects would not cumulate with BART, since they result in displacement in areas unaffected by the proposed BART extension. The cumulative effects in South San Francisco would be mitigated to below a significant level by the city's redevelopment efforts, which would offset the loss of homes and businesses. With implementation of these efforts, there will be a net increase in housing and employment.

2.5 Neighborhood Impact Assessment and Mitigation

Significance Criteria and Methodology

Implementation of the project would create a significant neighborhood social impact if it disrupted the physical and social arrangements of an established community; conflicted with established recreation or education uses of an area; increased the level of activity (traffic, parking, noise), thereby detracting from the quality of a neighborhood; affected a low-income or minority community to a greater extent than other segments of the population; or modified the aesthetics of a neighborhood. Implementation of the project would create a beneficial impact if it improved regional mobility and access, particularly for transit-dependent individuals. Impacts to neighborhoods are also found in Section 1, Transportation; Section 2.3, Land Use/Economic Activity; Section 2.4, Acquisition and Displacement; Section 3.3, Visual Quality; Section 3.9, Noise and Vibration; and Chapter 7, Environmental Justice.

The neighborhood impact analysis involved review of city and county documents regarding the potentially affected communities, interviews with knowledgeable officials in the communities, attendance at public meetings held regarding the proposed project, extensive fieldwork, and experience with assessments and implementation of similar projects.

South San Francisco

1. *The Aerial Design Option LPA would cause residential and business displacement for the Hickey Station, thereby disrupting social patterns of shopping, circulation, and neighborhood activities. (S)*

   In general, residents have established social patterns of shopping, recreation, and visiting, similarly, businesses have established relationships with their customers, particularly if the businesses provide local-serving retail or commercial services. After acquisition and relocation, residents and businesses may have difficulty re-establishing these patterns, especially if they are relocated to another community.

   MITIGATION MEASURES. While compliance with acquisition and relocation laws can address economic loss, there are no feasible mitigation measures that could reduce the social impacts.

San Bruno

2. *The Aerial Design Option LPA would not affect the social cohesion of the Fifth Addition neighborhood. (I)*

   The Fifth Addition neighborhood lies east of the CalTrain tracks. No part of the BART alignment, station facilities, or ancillary facilities would encroach into this area, alter circulation patterns, or create physical barriers separating the neighborhood. The only noticeable alteration would be the reconstruction of Huntington Avenue (west) eastward atop the existing, unused SPTCo San Bruno branch tracks. The realignment of Huntington Avenue would make it closer to the Fifth Addition, but this would neither enhance nor detract from the cohesion of this predominantly single family residential neighborhood.

Millbrae

3. *The Aerial Design Option LPA would displace the residents of the Millbrae Gardens neighborhood. (S)*

   This area consists of a group of approximately 30-year-old apartment buildings that represent 7 percent of the rental housing in Millbrae. Over half of the buildings have the identical design and were built originally as a single development. They are easily accessible by CalTrain and the highway and are conveniently located near SFIA and the major Burlingame employment corridor. The lack of comparable rental housing in the vicinity of Millbrae Gardens would make this a significant loss.

   MITIGATION MEASURES. While compliance with acquisition and relocation laws can address economic loss, there are no feasible mitigation measures that could reduce the social impacts.

4. *The Aerial Design Option LPA would affect the minority and lower income population of Millbrae (see Chapter 7 for a discussion of environmental justice). (S)*

The Millbrae Avenue Station layout would require acquisition of 202 units of multi-family housing at Millbrae Gardens. According to the 1990 census, the population in the block which comprises Millbrae Gardens was 41 percent Hispanic and 25 percent Asian and Pacific Islander. These groups account for 17 percent and 11 percent, respectively, of the total population of Millbrae.

The median rent here was $687, compared to the citywide median of $838. According to the census, the tract that includes Millbrae Gardens had a median household income of $31,829, while the city wide median was $46,000, and the poverty rate was almost twice the city's rate. These indices suggest that the Millbrae Gardens has a lower income population.

The above statistics support characterization of this area as a lower income, minority area of Millbrae. Because the affected population represents 28 percent of the city's minority population and the displaced units represent a large proportion of the city's available rental housing stock, the proposed project would have a significant socioeconomic impact on the neighborhood and the city.

MITIGATION MEASURES. While compliance with acquisition and relocation laws can address economic loss, there are no mitigation measures that could reduce the social impacts.

5. *Access to the Bayside Manor neighborhood would be improved under the Aerial Design Option LPA. (B)*

Bayside Manor is a cul-de-sac subdivision which can only be reached by a circuitous route via Rollins Road from Millbrae Avenue. Under the proposed project, Hillcrest Boulevard would be widened and extended from El Camino Real into the neighborhood at Aviador Avenue. This would provide a more direct route to and from Bayside Manor, enable the neighborhood to become more integrated with the rest of the city, and improve emergency vehicle access.

Project Corridor

6. *Proximity to new BART stations would improve transit accessibility particularly for the transit-dependent population. Residents near new BART stations would receive improved transit service to significant activity centers, as well as improved community bus service. (B)*

Cumulative Analysis

Development called for in the *El Camino Corridor Redevelopment Area Plan* in South San Francisco would cumulate with that around the Hickey Station, contributing to the intensification of development in semi-urban, low-density, mixed-use areas. This change would be perceived negatively by residents who enjoy proximity to small agricultural plots and the wholesale nursery. In San Bruno, the combined impacts of BART, increased CalTrain service, and the expanded SFIA activity would significantly affect the Fifth Addition and the Belle Air neighborhoods, due to property acquisition requirements and increased noise and traffic. Noise abatement programs at the SFIA and BART's design criteria would minimize noise impacts. Traffic improvements at the Hickey Station and in San Bruno would mitigate the traffic congestion. The cumulative displacement in South San Francisco can be partially mitigated by implementation of the El Camino Corridor redevelopment project by the city.

Section 3
Visual Quality

3.1 Introduction

The visual quality of an environment is shaped by its visual resources and landscape. Visual resources include: 1) built features such as buildings, structures, parking areas, roads, utilities, and signs; and 2) natural features such as hills, vegetation, rock outcroppings, and water bodies. These resources together make up the line, form, scale, color, and texture of an area's landscape. This section describes these attributes along the project corridor and assesses potential impacts to them generated by operation of the Aerial Design Option LPA. Impacts that are directly related to construction are addressed later in Section 3.13, Construction. The project corridor is the relevant area of analysis because visual impacts are normally experienced close up. Nonetheless, a larger impact area which encompasses long range views is also considered.

In addition, the vantage point of the viewer influences the perception of the visual setting. Key views of and from the project corridor, and the features that make up these views or contribute to the area's visual quality, are identified and described in this section.

The following elements of visual quality are used to describe the visual resources and landscape of the project corridor: 1) the built environment; 2) significant views and scenic resources; 3) sensitive receptors; and 4) streetscapes.

- **Built environment.** Refers to the type and scale of development and noteworthy visual features in the vicinity of the project corridor. Scale is defined by the height and depth or mass of structures adjacent to the corridor.
- **Significant views and scenic resources.** Concerns open view corridors and visually distinctive built or natural features that are visible from public spaces. Public spaces include roads, cemeteries, government centers, and parks.
- **Sensitive receptors.** Includes land uses with sensitivity to changes in the visual setting, such as residences, cemeteries, and parks.
- **Streetscape.** Refers to the width of the street, its landscaping, the height of facing buildings, building setbacks, and the continuity of structures fronting the street. A streetscape is well-defined when the visual features are human-scale (i.e., streets are narrow and landscaped; buildings have similar setbacks, height, and scale; and building facades are continuous).

3.2 Existing Conditions

The built environment along the project corridor ranges from cemetery-related, classic-style structures along Mission Road within Colma to the one- and two-story residential and commercial/industrial buildings in South San Francisco, San Bruno, Millbrae, and Burlingame..

The natural environment within the project corridor is characterized by extensive cemetery landscaping in Colma and open areas in San Bruno. San Bruno Mountain is a landmark visible from most of the project

corridor. West of the corridor, the ridgeline along the coast defines the distant visual backdrop. Wooded areas along the SPTCo right-of-way in South San Francisco and San Bruno are populated primarily with eucalyptus and evergreen trees.

Photographs were taken to document the existing visual setting from a number of locations throughout the project corridor, as illustrated in Figure 3.3-1.

Town of Colma

Built Environment. Over 77 percent of Colma is devoted to cemeteries, agriculture, and open space (Colma, 1987). Memorial parks that flank El Camino Real are the predominant development type in this area, defined by manicured lawns, extensive tree plantings, ornate structures, and monuments. The entrance to Cypress Lawn Memorial Park, depicted in Figure 3.3-2, Photo 1, illustrates the pastoral "front door" to El Camino Real. Also part of the built environment, the Daly City Shop/Yard, adjacent to the Colma BART Station, provides for maintenance and inspection of BART vehicles.

Significant Views and Scenic Resources. El Camino Real, designated a scenic route in the general plan, is six lanes wide with a 28-foot median. Median strip planting adds to its scenic quality and reinforces Colma's open space character.

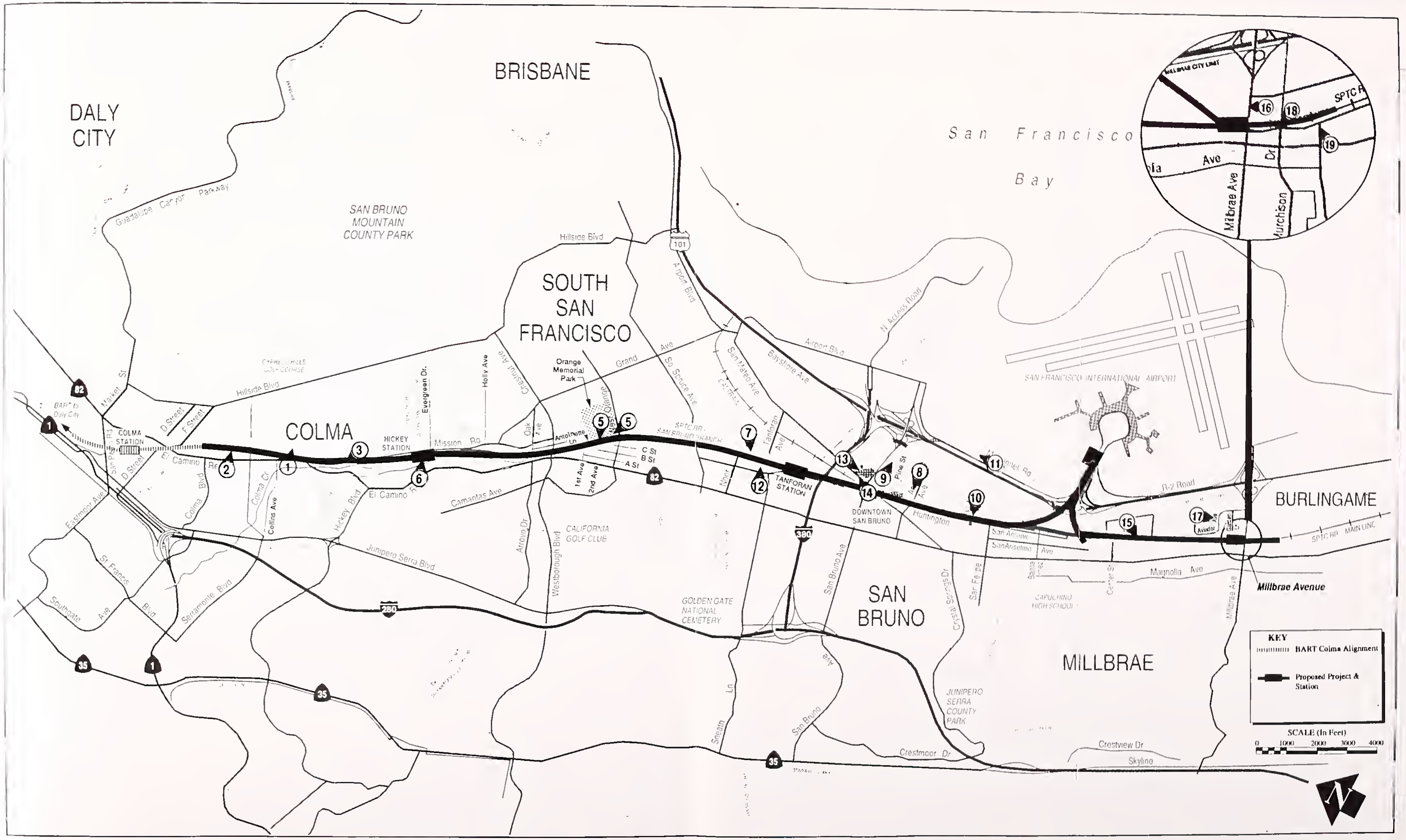
Significant views in Colma include short-range views from El Camino Real toward the cemeteries, and long-range views of San Bruno Mountain. Mature trees are important scenic resources as viewed from El Camino Real and adjacent streets (Figure 3.3-2, Photo 2). Trees that parallel the project corridor between F Street and Serramonte Boulevard provide cemetery landscaping. Most cemeteries are accessed from El Camino Real, a road providing views of rolling hills, manicured landscaping, and varied memorial park architectural styles. Views of San Bruno Mountain are possible from Olivet Parkway and Collins Avenue and the cemeteries. On the corner of Serramonte Boulevard and El Camino Real lies the Colma Town Hall, with its distinctive Spanish-style architecture.

Sensitive Receptors. Within the project corridor, the cemeteries along El Camino Real are sensitive receptors in Colma. There are also scattered residential areas in Colma along Mission Road and El Camino Real.

Streetscape. El Camino Real, Serramonte Boulevard, and Mission Road are primary routes in Colma that may be affected by the project. Streetscapes along these routes are automobile rather than pedestrian oriented or are not particularly well defined. Although El Camino Real is recognized as a scenic route, setbacks are varied (but typically at least 30 feet from the street) and building facades are non-continuous, making the route generally not pedestrian oriented.

South San Francisco

Built Environment. At South San Francisco's boundary with Colma, the Treasure Island Trailer Court is located directly west of the project corridor near the crossing of Colma Creek (Figure 3.3-2, Photo 3). South of the mobile homes, the built environment transitions to a single family subdivision and the large-scale, low-rise El Camino High School on the east side of the alignment and the large-scale, freestanding Macy's distribution center on the west side. Along Mission Road between Evergreen Drive and Holly Street are two- to three-story apartments and commercial offices.



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Site Photo Index

FIGURE 3.3-1

1: Entrance to Cypress Lawn Memorial Park Cemetery, *Facing East*

2: El Camino Real at Olivet Parkway, *Facing East*

3: Treasure Island Trailer Court from Mission Road, *Facing Northwest*

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Colma Area Photos
Photos 1, 2, 3

FIGURE **3.3-2**

The well-landscaped San Mateo County Government Center fronts Mission Road between Grand Avenue and Oak Avenue.

The five-story Kaiser Medical Center and parking garage is a prominent visual element west of the project corridor on El Camino Real. From Chestnut Avenue to Orange Memorial Park, on the east side of the project corridor, are low-rise businesses and multi-family residences.

Orange Memorial Park is a recreational area that provides relief from the urban landscape. Near the park, the built environment consists mainly of single family residences with a few small-scale institutional uses, including the Boys and Girls Club (Figure 3.3-3, Photo 4), Los Cerritos School, and South San Francisco High School athletic field. A row of tall trees, depicted in Figure 3.3-3, Photo 5, stands along Memorial Avenue adjacent to the project corridor and provides a visual edge that helps define the residential neighborhood to the west.

Between West Orange Avenue and South Spruce Avenue, the built environment is characterized by a low-rise residential and commercial district. South of South Spruce Avenue, large, low-profile industrial and commercial uses, including the two-story Zellerbach warehouse, are visible on both sides of the project corridor.

Significant Views and Scenic Resources. There are no designated scenic routes in South San Francisco. However, significant views from Mission Road and the project corridor include San Bruno Mountain in the distance to the east, and the hills and trees behind El Camino High School in the mid-range, as depicted in Figure 3.3-3, Photo 6.

In addition, near Oak Avenue and Antoinette Lane, distant views of San Bruno Mountain are available from the project corridor, as are intermittent, close-up views of Orange Memorial Park through the trees that parallel the corridor.

Along Antoinette Lane, a grove of eucalyptus trees is visible from El Camino Real, Mission Road, and Antoinette Lane that can be considered a scenic resource. The mature trees along Memorial Avenue adjacent to the park are also considered a visual resource. Residents as well as park users have views of the trees, as do drivers and pedestrians along Memorial Avenue and West Orange Avenue.

Sensitive Receptors. The majority of sensitive receptors in South San Francisco are residences. The following list identifies sensitive receptors near the project corridor and their approximate distance from the proposed centerline of the BART tracks:

- Treasure Island Trailer Court – West of project corridor south of South San Francisco city limit, with access from Mission Road and El Camino Real: 30 feet.

- Single family homes – East side of Mission Road on the east side of the project corridor between Evergreen Drive and Sequoia Avenue: 150 feet.

- Two- and three-story condominiums – West side of Mission Road on the east side of the project corridor between Evergreen Drive and Holly Avenue: 30 to 60 feet.

- Kaiser Medical Center – East side of El Camino Real on the west side of the project corridor: 130 feet.

- Three-story apartments – West side of Mission Road north of Grand Avenue behind the Kaiser Medical Center parking structure: 50 feet.

4: Boys and Girls Club at the Intersection of West Orange and Memorial Avenues, *Facing Northwest*

5: View from Orange Memorial Park, *Facing West*

6: El Camino High School across from Proposed Hickey Station Site, *Facing East*

7: Typical Industrial Development on Maple Avenue, East of the Project Corridor

OGDEN

South San Francisco Area Photos
Photos 4, 5, 6, 7

FIGURE

3.3-3

- Two-story residences – East side of Mission Road south of Grand Avenue: 100 feet.
- Three-story apartments – East side of Antoinette Lane north of Chestnut Avenue: 225 feet.
- Three-story apartments – East side of Antoinette Lane south of Chestnut Avenue: 90 feet.
- Single family homes – Town of Baden neighborhood on 1st, 2nd, A, B and C Streets across from Orange Memorial Park: 150 feet.
- Orange Memorial Park and two-story apartments – Corner of West Orange Avenue and Memorial Drive: 100 feet. (The park and the apartments are visually separated from the project corridor by a tall row of eucalyptus trees along Memorial Avenue adjacent to the park.)
- Single family residential neighborhood – South of West Orange Avenue on Myrtle Avenue east of the project corridor: 50 feet.
- Francisco Terrace Tot Lot – On the north side of South Spruce Avenue between Terrace Drive and Huntington Avenue and the CalTrain tracks: 180 feet.
- Industrial Village, two-story condominiums – End of C Street south of West Orange Avenue and west of the project corridor: 150 feet.
- Two-story single family homes – Between South Spruce and South San Francisco High School and west of the project corridor: 100 feet.

Streetscape. In the residential and commercial environment along Mission Road between Evergreen Drive and Chestnut Avenue, landscaping and sidewalks provide an accessible, well-defined pedestrian streetscape. West Orange Avenue is defined by Orange Memorial Park on the north side and by single family residences east and west of the SPTCo right-of-way. The combination of narrow setbacks, sidewalks, landscaping, and street trees creates an attractive pedestrian environment. On the other hand, El Camino Real, South Spruce Avenue, Huntington Avenue are generally weakly defined, automobile-oriented routes or are commercial areas without a pedestrian orientation.

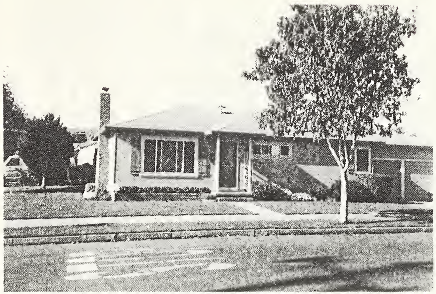
San Bruno

Built Environment. Visual features in San Bruno along the project corridor include predominantly low-profile, small-scale homes and commercial buildings. Exceptions include the large-scale, mid-rise Tanforan Park Shopping Center, the Towne Center shopping complex, the I-380 viaduct, and SFIA-related facilities east of Highway 101. At the border of San Bruno and South San Francisco, large commercial buildings comprise the built environment in the project corridor west of the SPTCo tracks, and small lot homes of the Fifth Addition neighborhood define the corridor east of the tracks. An industrial facility, illustrating the typical scale and form in this area, is shown in Figure 3.3-3, Photo 7.

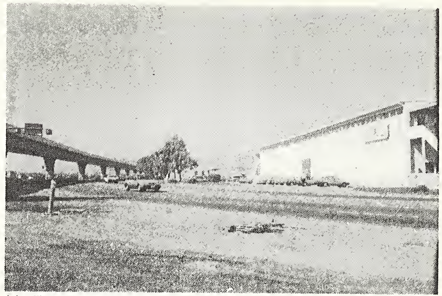
The low-rise Fifth Addition and Belle Air single family residential neighborhoods in San Bruno contrast with the Tanforan Park Shopping Center and its massive parking structure. Figure 3.3-4, Photo 8 is representative of the development in the Belle Air neighborhood. Small-scale, low-rise commercial uses are concentrated along San Mateo and San Bruno Avenues, San Bruno's local retail area (Figure 3.3-4, Photo 9). Huntington Avenue south of the Central Business District to Lomita Park contains predominantly low-rise residential uses on its west side and the CalTrain corridor on its east side.

8: Belle Air Neighborhood Home on Third Ave, North of Angus Avenue, *Facing West*

9: San Bruno Avenue, *Facing East*



10: Lomita Park Home on Huntington Avenue



11: Typical Airport-Related Facility with Highway 101 to the Left, *Facing North*

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San Bruno Area Photos
Photos 8, 9, 10, 11

FIGURE 3.3-4

Overhead transmission lines run parallel to Huntington Avenue. Figure 3.3-4, Photo 10 depicts a representative home in the Lomita Park neighborhood.

Land uses east of and parallel to Highway 101 are predominantly large-scale, freestanding commercial buildings and warehouses, SFIA-related facilities, and large surface parking lots. The typical scale of these buildings is shown in Figure 3.3-4, Photo 11.

Significant Views and Scenic Resources. San Bruno Mountain is the predominant scenic resource in the distant northeast. The dense, tall vegetation along parts of Huntington and San Antonio Avenues may be considered local scenic resources. There are no designated scenic routes in San Bruno located within the project corridor.

Lion's Field Park and the SFIA property west of Highway 101 (also known as the west of Bayshore parcel) provide expanses of open space. The undeveloped nature of these areas offers San Bruno residents an open space resource.

Sensitive Receptors. The majority of sensitive receptors in San Bruno are residences. Residential areas in proximity to the project corridor include the Belle Air and Fifth Addition neighborhoods east of Huntington Avenue, and homes along Huntington and San Antonio Avenues between Angus Avenue and the southern city limit. Dense rows of trees run along San Antonio Avenue and screen homes from the CalTrain tracks.

Parks in San Bruno in the vicinity of the project corridor include the Bayshore Circle Park, Herman Tot Lot, both in the Fifth Addition neighborhood; the 7th and Walnut Park and 7th Avenue Park, both along 7th Avenue; Posy Park on Huntington Avenue; and Lion's Field Park south of Sylvan Avenue along Huntington Avenue.

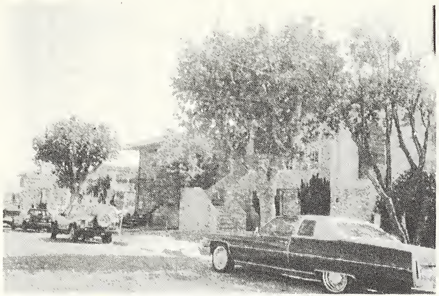
Streetscape. Attractive, well-defined streetscapes can be found on local streets in San Bruno's residential neighborhoods, as well as along several major travel corridors, identified below.

- **Huntington Avenue.** The streetscape along Huntington Avenue across from the Tanforan Park Shopping Center is depicted in Figure 3.3-4, Photo 12. Fairly continuous facades, street trees, and sidewalks create a human-scale, pedestrian environment in this neighborhood. Mature trees and well-manicured yards are characteristic of the streetscape in the Belle Air neighborhood in San Bruno (Figure 3.3-4, Photo 13). Huntington Avenue between Sneath Lane and Noor Avenue is 130 feet from the proposed centerline of the BART tracks.

- **San Bruno Avenue.** Although this heavily traveled arterial is not pedestrian oriented, its intersection with San Mateo Avenue is considered a major point of entry to the city and is distinguished by well-maintained landscaping.

- **San Mateo Avenue.** As depicted in Figure 3.3-4, Photo 14, San Mateo Avenue is a two-lane road with sidewalks, overhead utility lines, narrow setbacks, and street parking. Facades and sidewalks are continuous from San Bruno Avenue north to I-380, but there is virtually no landscaping along San Mateo Avenue. This street is accessible to pedestrians but not pedestrian oriented because it lacks human-scale features and landscaping. In contrast, San Mateo Avenue south of San Bruno Avenue and west of the tracks has continuous storefront facades, narrow setbacks, sidewalks, and landscaping which create a traditional pedestrian-oriented environment.

12: Huntington Avenue Streetscape from Opposite Side of the Project Corridor



13: Typical Belle Air Streetscape along Walnut Street

14: Streetscape of San Mateo Avenue North of San Bruno Avenue

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San Bruno Area Photos
Photos 12, 13, 14

FIGURE 3.3-4

- **San Antonio Avenue.** San Antonio Avenue parallels the CalTrain tracks and is defined by continuous, low-profile residential facades and sidewalks along its western side and rows of eucalyptus along the eastern side. San Antonio Avenue is human in scale and pedestrian accessible. These features create an attractive view corridor.

Millbrae

Built Environment. The built environment surrounding Millbrae Avenue east of the CalTrain tracks is characterized by low-profile residences and small-scale commercial buildings. Figure 3.3-5, Photos 15 and 16 are representative of typical residential and commercial land uses in this area. Bayside Manor is a single family residential enclave with both one- and two-story homes (Figure 3.3-5, Photo 17). The Millbrae Manor neighborhood is characterized by low-profile, single family homes; the Millbrae Gardens neighborhood contains both one-story homes and two-story apartment buildings.

Significant Views and Scenic Resources. The neighborhoods on the east side of the SPTCo/CalTrain tracks sit on flat land; distant views toward the ridgelines are intermittent from east- and west-oriented streets. Views toward the east and northeast are dominated by electric transmission towers and by a Highway 101 overpass.

The most prominent scenic resource in this area is the SFIA property in San Bruno and unincorporated San Mateo County. Its undeveloped state offers a natural setting and views of San Bruno Mountain to the north. The west of Bayshore parcel is not visible from any main travel routes in the vicinity of Millbrae Avenue.

Sensitive Receptors. Sensitive receptors within the project corridor in Millbrae include El Rancho Inn, apartment buildings west of the CalTrain tracks, neighborhoods east of the tracks, and Marino Vista Park. The Bayside Manor, Millbrae Manor, and Millbrae Gardens residential areas, and the nursing home on Serra Avenue are sensitive receptors between Center Street and Millbrae Avenue.

Streetscape. The main travel route in the Millbrae portion of the project corridor that may be affected by the project is Millbrae Avenue. Millbrae Avenue is auto-oriented, with four lanes of two-way traffic and low-profile commercial and industrial building facades.

Burlingame

Built Environment. The built environment in the Burlingame portion of the project corridor includes a combination of commercial, industrial, and office uses. The east side of the SPTCo/CalTrain right-of-way at the border of Burlingame and Millbrae is characterized by low-profile, small-scale industrial facilities. The Guittard Chocolate Company is typical of the industrial uses in this area.

The visual setting along the west side of the SPTCo right-of-way is defined by mid-rise commercial and office buildings. The Peninsula Professional Center at five stories is the tallest structure in this area. Figure 3.3-6, Photo 18 is representative of the scale of buildings along California Drive.

Significant Views and Scenic Resources. Intermittent views of the rolling hills west of El Camino Real are available from California Drive, Rollins Road, and El Camino Real. Views to the east from California Drive are generally screened by mature trees which line both sides of the SPTCo/CalTrain tracks (Figure

15: Typical Residences East of the Project Corridor

16: Millbrae Avenue between Rollins Road and the CalTrain Crossing, *Facing North*

17: Typical Home on Aviador Drive in the Bayside Manor Neighborhood, *Facing South*

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Millbrae Area Photos
Photos 15, 16, 17

FIGURE **3.3-5**

18: Typical Building Scale along California Drive, *Facing West*

19: View toward CalTrain Alignment at the Intersection of Trousdale Drive and California Drive, *Facing East*

OGDEN

Burlingame Area Photos
Photos 18, 19

FIGURE 3.3-6

3.3-6, Photo 19). The abundant, mature trees that line California Drive and the SPTCo/CalTrain right-of-way are considered scenic resources in Burlingame.

Sensitive Receptors. The Care West Burlingame convalescent home is a sensitive visual receptor located on the corner of Trousdale and California Drives. A congregate care facility is proposed at 1733 California Drive between Trousdale Drive and Dufferin. This facility would be located approximately 160 feet from the proposed BART alignment, and thus no visual impact would occur. There are no other sensitive receptors near the project corridor.

Streetscape. The main travel routes that may be affected by the project in the Burlingame portion of the project corridor, California Drive and Rollins Road, contain mostly commercial and industrial uses and are not particularly well defined.

3.3 Impact Assessment and Mitigation

Significance Criteria and Methodology

Implementation of the BART extension would result in a project-specific or cumulative significant visual impact if BART facilities were incompatible in scale with adjacent structures; if significant views or scenic resources were eliminated; if BART were closer than 60 feet to a sensitive receptor (the distance from which facial features are discernible), because a feeling of encroachment may be perceived and light and glare effects would be noticeable; and if existing features which contribute to a well-defined streetscape were eliminated. While this section identifies inconsistencies with adopted general plans, these inconsistencies are not considered significant impacts, because BART is not required by law to comply with local plans and policies. Any visual impact associated with loss of parks is addressed in Chapter 5, Section (4f) Evaluation.

Project-Specific Analysis

Colma

1. *BART would travel in subway through Colma and consequently would have no effect on the built environment. The proposed above-grade ancillary facilities would be partially visible, but would not adversely affect scenic resources, significant views, or sensitive receptors. (I)*

   The proposed project would extend through Colma in subway and would not be visible to pedestrians, motorists, or cemetery visitors. There would be no significant change to Colma's visual environment due to the alignment.

   Two ancillary facilities would, however, be above grade. An approximate 40x30x15-foot train control bungalow and a 48x15x10-foot concrete ventilation building would be located east of Mission Road in the Holy Cross Cemetery and would occupy a plot of land with an approximate 80x60x10-foot protective fence on the perimeter. The proposed site for these ancillary facilities is surrounded by vegetation that would not be removed and, thus, the BART facilities would be screened and would not significantly alter the visual setting.

2. *The Aerial Design Option LPA would result in the removal of mature trees within the cemeteries, identified as important scenic resources in Colma. (S)*

A 60- to 110-foot-wide strip of land would be cleared of vegetation to accommodate the shallow subway box for the proposed project. After construction, this vegetation would be replaced with shallow-rooted plants and shrubs. Until landscaping reaches full maturity, the impact to scenic resources would be significant.

MITIGATION MEASURES. Implementation of the following mitigation measure would reduce the long-term impact of tree removal; however, the short-term impact would remain significant and unavoidable.

2.1 Vegetation Replacement. BART will prepare a plan and commit to recommendations that identify individual, mature, healthy trees to be preserved; specify the means of marking these trees to avoid their removal during construction; and identify the number, species, size, location, and maintenance of replacement trees required to mitigate the loss of healthy mature trees.

3. *As part of the modification of the Daly City Shop/Yard, the 8- to 12-foot sound wall around the proposed turntable would create a sense of encroachment or enclosure for nearby residents in the Meadowbrook Trailer Park. (S)*

Although the sound wall would not be out of context with the other facilities in the Daly City Shop/Yard including the Colma Station parking structure, it would worsen the sense of enclosure at the Meadowbrook Trailer Park created by the existing facilities. Installation of the wheel-truing machine, also part of the Daly City Shop/Yard, would occur entirely within the existing boundaries of the yard and would not significantly alter its appearance. The wheel-truing machine would be constructed within an expanded building and would not be visible. Since the building would only expand by about 25 percent horizontally and away from any residences, it would not significantly alter the visual setting.

MITIGATION MEASURES. There are no feasible mitigation measure that would reduce the height and mass of the sound wall; therefore, this impact would remain significant and unavoidable. However, implementation of the following measure may partially reduce the perception of encroachment.

3.1 Sound Wall Vegetation. BART will plant drought-tolerant vine species along the sound wall or apply a similar treatment to the wall's exterior surface to soften the wall and reduce the sense of encroachment. Possible design modifications to the turntable (see Noise and Vibration Mitigation Measure 2.2) may be implemented by BART, if feasible, to reduce noise to insignificant levels without the use of a sound wall. A potential effect of sound walls is that they become targets for graffiti. To minimize this potential, design of BART system facilities includes graffiti-resistant wall finishes and the application of paint that increases the ease of removing graffiti.

4. *A 20-foot-high rail car wash facility and an auxiliary track for up to two trains would be located near the beginning of the Colma tailtracks at the Daly City Shop/Yard. (I)*

The car wash facility would not significantly alter the visual setting which consists of the existing Colma Station and parking garage. Views from the Meadowbrook Trailer Park would be screened by the proposed sound wall and no scenic resources or significant views would be obstructed.

South San Francisco

5. *The BART alignment is in subway and would therefore have no effect on the South San Francisco visual environment. Several ancillary structures would be above ground but would be screened from view by existing structures and trees. (I)*

   Above-grade ventilation structures would alter the visual setting along the BART alignment in South San Francisco but would not obstruct significant views or scenic resources, alter streetscapes, or be located within 60 feet of sensitive receptors. Additionally, BART will landscape the perimeter of the traction power substations and train control bungalows. Therefore, these facilities would not have an adverse visual effect on the built environment.

   The most visible of the ventilation shafts would be located above the subway alignment across from Orange Memorial Park near 2nd Street in South San Francisco. This 130x50x12-foot structure would not obstruct views of the park from nearby residences. Residences would be greater than 60 feet from the structure. A train control bungalow would be located adjacent to the ventilation structure and would be screened by landscaping.

   Other ventilation shafts in South San Francisco would be similar in size but less prominent above the ground surface.

   Two radio antennas would be taller than nearby structures but would not block significant views or disrupt sensitive receptors.

6. *The proposed Hickey Station, the "new street," the Hickey Boulevard extension between El Camino Real and Mission Road, and ancillary facilities would be visually compatible with the surrounding mid- to large-scale development and would not significantly affect scenic resources or sensitive receptors. Distant views of San Bruno Mountain and of the western ridgeline are intermittent from a motorist's perspective and would therefore not be adversely affected. (I)*

   The proposed Hickey Station would be constructed in subway, but the four-level parking structure, two ventilation shafts, and a 25-foot radio antenna atop the parking structure would be visible. As viewed from either Mission Road or El Camino Real, the Hickey Station and parking structure and ancillary facilities would not be out of scale with the large-scale Macy's warehouse to the north and Kaiser Medical Center to the south. The proposed BART parking structure would be slightly less massive, but not out of context with these other buildings.

   The station and parking structure would interfere with distant views of San Bruno Mountain from El Camino Real and with views of the western ridgeline from Mission Road. The Hickey Station parking garage along El Camino Real would be visually prominent and would displace mid-range views of buildings and cemeteries and distant views of San Bruno Mountain. These views are at best intermittent and fleeting from a motorist's perspective, and are not considered high quality nor visually significant. Since all sensitive receptors in the area would be further than 60 feet from the station, there would be no visual impact on these receptors.

   MITIGATION MEASURES. Although the impacts of the Hickey Station and ancillary facilities would be insignificant, the following suggestions would minimize potential light and glare effects, for nearby residents to the east and west at higher elevations who would be able to look down on the station facilities.

6.1 *Station Light and Glare Screening.* The density of trees planted by BART will be sufficient to buffer nearby residences and provide additional screening from parking lot lights without compromising station security. Street trees will be selected that have full canopies and reach a height of about 30 to 40 feet at maturation. Species will be acceptable to both BART and the city.

6.2 *Station Lighting Fixtures.* BART construction documents will specify that station and parking light fixtures be fitted with lenses, hoods, and reflectors to minimize spillover light and glare into adjacent residences while still providing adequate security.

7. *The proposed Hickey Station and related facilities would be compatible with the scale of surrounding development and may enhance the fragmented or poorly defined streetscapes along Mission Road and El Camino Real by creating a visual focal point and stronger street facade. (B)*

Mission Road and El Camino Real, which provide access to the Hickey Station, do not have well-defined streetscapes. El Camino Real is auto-oriented, with sidewalks predominantly on the west side. The proposed parking structure for the Hickey Station would front El Camino Real, thereby creating a visual edge, providing a better sense of enclosure, and improving the street facade between Macy's and Kaiser Medical Center. The design and landscaping of the BART parking garage would have a beneficial effect by strengthening the visually fragmented and unorganized setting. The proposed landscaping of the BART parking areas off Mission Road would enhance the appearance of this area.

8. *The Aerial Design Option LPA would require the removal of mature trees identified as scenic resources along Antoinette Lane and Memorial Avenue, adjacent to Orange Memorial Park in South San Francisco. (S)*

Between Chestnut and Orange Avenues, the right-of-way narrows and passes a stand of mature trees adjacent to Orange Memorial Park and along Antoinette Lane. The trees along Memorial Avenue are visible from the park, the Town of Baden neighborhood, and from West Orange Avenue. The grove of eucalyptus trees along Antoinette Lane is visible from several three-story apartments along Antoinette Lane, and from El Camino Real and Mission Road. These groves of mature trees, identified as scenic resources in South San Francisco, would be removed, resulting in a significant visual impact.

MITIGATION MEASURES. Implementation of Mitigation Measure 2.1 identified above, i.e., vegetation replacement, would partially reduce the long-term impact of tree removal, but the short-term impact would remain significant and unavoidable.

San Bruno

9. *Within San Bruno, a sound wall would be located between the CalTrain and BART alignments. The sound wall would not alter the visual setting for Lomita Park residents, since it would lie east of CalTrain and would be partially screened by both CalTrain and the existing trees west of the tracks. (I)*

In order to reduce potential noise impacts to residents along Huntington and San Antonio Avenues, the Aerial Design Option LPA includes a sound wall located between the BART and CalTrain mainline rights-of-way between a point approximately 400 feet north of San Felipe Avenue in San

Bruno and approximately 300 feet north of Madrone Street in Millbrae. The sound wall would vary in height depending on potential noise impacts. The wall would not result in visual disturbance or obstruct significant views of the open space area at the SFIA west of Bayshore parcel. Views of this area are largely screened now by the eucalyptus trees, resulting in no net change in terms of views of the open space area. The sound wall would lie over 100 feet from residences in the Lomita Park neighborhood west of the tracks. Existing trees west of the tracks that help to screen views of CalTrain and the tracks would remain intact and thus also help obstruct views of the sound wall and BART operations.

10. *The Tanforan Station parking structure would alter the existing built environment. The effects to the built environment of the Fifth Addition neighborhood from this facility would not be significant because the structure is of similar height, scale, and massing to adjacent structures at the shopping center. Similarly, westerly views of the foothills from the Fifth Addition residences would not be affected because these views are already affected by existing structures. (I)*

BART proposes a new four-story parking structure approximately 42 to 50 feet high. While taller than the single-story residences of the Fifth Addition that front onto Huntington Avenue, the parking structure is far enough away and is viewed against larger structures so that scale incompatibilities with the adjacent residences are not apparent.

The tallest of the station facilities, the parking structure, would not have a significant effect on the scenic views from the Fifth Addition neighborhood because these views are already affected by the height, mass, and scale of the existing Tanforan Park Shopping Center. In addition, the parking structure lies over 200 feet from Fifth Addition residences. As a result, the parking facility occupies a relatively small proportion of the viewshed for Fifth Addition residents.

11. *Above-ground ventilation structures would be introduced into the area between Tanforan Avenue and Sylvan Avenue; however, significant views or scenic resources would not be obstructed, streetscapes would not be altered, and sensitive receptors would be greater than 60 feet away. (I)*

Although the alignment would be constructed in subway through the Tanforan Station to San Bruno Avenue, two ventilation structures would be located at grade above the tracks near Euclid Avenue and Sylvan Avenue.

A ventilation building, visible approximately 10 feet above grade, would be located approximately 300 feet south of Euclid Avenue behind the San Bruno Lumber Yard. The structure would be located in a setting characterized by the CalTrain alignment and an industrial yard behind San Bruno Lumber. Since no significant views or scenic resources exist, the streetscape is not well defined, and sensitive receptors would be greater than 60 feet away, no significant impact would occur.

12. *Above-ground ancillary structures located at the site of the existing San Bruno CalTrain Station would introduce new visual elements into the area. These facilities would be compatible with the surrounding environment, however, and would not obstruct significant views or affect streetscapes or sensitive receptors because of their location east of the CalTrain tracks, distance from sensitive receptors, and landscaped screening. (I)*

Ancillary facilities would be located near Sylvan Avenue east of the existing CalTrain tracks and San Bruno CalTrain Station. Because of their relatively low, approximately 15-foot profile, the

traction power substation, train control bungalow, and ventilation shaft would not obstruct significant views from Huntington Avenue and would be screened from homes on Huntington Avenue by existing trees.

Although these structures are low-profile, the substation would occupy a plot of land with a 200x65x15-foot protective fence on the perimeter, and house two structures, one approximately 130x20x15 feet and the other 40x20x15 feet. An approximately 40x30x15-foot train control bungalow would occupy a plot of land with an approximately 80x60x15-foot perimeter fence. The ventilation building would be 165x50x20 feet. The vent shaft height would project 10 feet above finish grade. A 25-foot antenna would be visible but would not constitute a significant alteration to the built environment or obstruct views. Although the antenna is tall, it would be so narrow that views would still be available around it.

Aerial Wye-Stub to the SFIA

13. *The aerial guideways across the SFIA property west of Highway 101 would alter the visual setting and detract from this area as a scenic open space resource. (S)*

The aerial wye-stub north and south legs to the Airport International Terminal Station would pass over the SFIA property west of Highway 101 and Highway 101 itself. The Aerial Design Option LPA would introduce an elevated guideway, approximately 50 feet above Highway 101, which would be visible from the Lomita Park neighborhood in San Bruno, and potentially visible from the Marino Vista in Millbrae, and by motorists traveling along Highway 101. The BART aerial structure would appear out of context with the undeveloped, natural setting of the west of Bayshore parcel and obstruct views of this area and San Bruno Mountain from Madrone Street in the Marino Vista neighborhood. Views would also be obstructed from Center Street as residents entered both the Marino Vista and North Millbrae neighborhoods. In addition, existing PG&E transmission lines would be raised a safe distance over the BART aerial structure. However, the BART aerial structure and new vehicular ramps into the airport would have the same architectural appearance approved by the San Francisco Airports Commission and the raised transmission lines would not significantly alter the visual effect of the existing transmission lines.

MITIGATION MEASURES. There are no feasible mitigation measures that would reduce the visual effect of the aerial guideway; therefore, the impact to scenic resources and significant views of this area and San Bruno Mountain would remain significant and unavoidable.

14. *The aerial Airport International Terminal Station would be visually compatible with the terminals and double-deck roadways at the SFIA. (I)*

The BART Board of Directors has adopted a set of design standards that call for the architectural, design, and functional integration of the BART station with the planned International Terminal. The station would be located under the ALRS guideway and station and likewise would be integrated visually and structurally with SFIA Master Plan improvements. Since the majority of the BART station infrastructure would be adjacent to the GTC/RCG, it would be even less visually obtrusive. As a result, this station location would not adversely affect the visual setting for airport passengers nor affect the aesthetics, design, or function of the planned International Terminal.

With respect to other criteria used in this visual analysis, the Airport International Terminal Station would not obstruct significant views, detract from a scenic resource, or disturb a high-quality

streetscape. In terms of station and guideway visibility, these BART facilities would only be visually prominent for motorists arriving from the north along Highway 101 on McDonnell Road. From the south, views would be screened by SFIA improvements, such as the planned International Terminal, the GTC/RCG, the ALRS, and the elevated highway ramps into and out of the airport. From the north, motorists would see BART's aerial guideway and the station facilities. The BART extension project would, however, be viewed in the setting envisioned by the SFIA Master Plan improvements and would be visually consistent with those projects.

15. *Ancillary structures located east of Highway 101 would be compatible with the surrounding visual setting. (I)*

A train control bungalow and traction power substation are proposed to be sited under the aerial guideway, adjacent to McDonnell Road and the proposed Highway 101 connection ramps. The visual setting at this location contains no significant views and there are no nearby sensitive receptors. Introduction of these facilities in this setting would be compatible with the existing airport-related, offices, and industrial activities.

Millbrae

16. *Ancillary facilities at the Millbrae Avenue Station would be visible but would not obstruct significant views or affect streetscapes or sensitive receptors. (I)*

A traction power substation and train control bungalow would be located south of the existing storm drainage channel and between the CalTrain right-of-way and the parking structure. There are no sensitive receptors within 200 feet of these facilities. Limited views of the ancillary facilities may be available from homes along Aviador Avenue in the Bayside Manor neighborhood, but the facilities would be viewed in the context of the BART parking structure, the station, and the Millbrae Avenue overpass. A below-grade gap breaker station would be located north of Murchison Drive. A ventilation shaft would be located above and east of the subway alignment across from Mateo Avenue and may be visible from residences along Hemlock Avenue. The ventilation shaft would be compatible with the visual setting, which includes the PG&E Millbrae Substation, would not obstruct significant views or scenic resources, and would be greater than 60 feet from homes.

17. *The Millbrae Avenue Station facilities would be incompatible in scale with the low-profile homes in the Bayside Manor neighborhood north of Millbrae Avenue and the commercial buildings to the south. Light and glare from parking area lights may also spill into the Bayside Manor neighborhood. (S)*

The four-story parking structure would be significantly larger in scale than the low-profile homes and commercial establishments. Nighttime illumination of the parking areas may be intrusive to nearby residences.

MITIGATION MEASURES. Implementation of Mitigation Measures 6.1 and 6.2 above, i.e., light and glare screening and modified lighting fixtures, would minimize potential light and glare effects to an insignificant level. The scale incompatibility impacts would remain significant and unavoidable.

18. *The landscaped wall and tailtracks in Millbrae and Burlingame would not result in significant visual effects. (I)*

A landscaped wall extending south from Murchison Drive to Dufferin Avenue in Burlingame would not affect significant views, streetscapes, or sensitive receptors. No significant views exist in this area, the California Drive streetscape is not well-defined, and sensitive receptors would be greater than 60 feet away. The wall in Burlingame would result in a loss of eucalyptus trees identified as a scenic resource along the CalTrain right-of-way. This loss would be offset by the proposed landscaping of the wall.

Burlingame

19. *At-grade turnback/tailtracks and an enclosed one-car emergency inspection pit located south of Murchison Drive would be visible but would not affect the built environment, significant views, sensitive receptors, or scenic resources. (I)*

    The tailtracks would provide storage for up to 60 BART cars and would be located east of the existing CalTrain tracks. The majority of the enclosed emergency inspection pit would be located below grade and would therefore not significantly alter the visual environment. The industrial land uses east of the track and the CalTrain alignment itself form the visual context for these proposed facilities. There are no significant views in the area. Additionally, views from California Drive toward the SPTCo right-of-way are predominantly screened by the row of trees that is fairly continuous. Although eucalyptus trees would be removed on the east side of the tracks near the drainage canal (not considered scenic resources), trees on the west side would remain in order to provide screening. The Care West Burlingame convalescent home is greater than 60 feet from the tracks and is separated from the tailtracks by CalTrain and a row of eucalyptus trees; thus, no significant impacts to this sensitive receptor would occur.

20. *The 1,500 feet of turnback/tailtrack would not conflict with Burlingame General Plan policies for protection of scenic routes.*

    Trousdale Drive between Sequoia Avenue and California Drive is classified as a scenic connector, and the general plan requires the visual quality of this street to be protected by screening objectionable views. The tailtracks would provide storage for up to 60 BART cars and would be located east of the existing CalTrain alignment. Views from the Trousdale/California intersection would be screened by the existing row of oleanders and other ornamental trees.

    Although El Camino Real is also a scenic route, its visual quality would not be compromised because views of the proposed alignment would not be readily available while traveling along this road. Views from the east side of the tracks would not be significantly altered because CalTrain already passes through this area and the addition of the tailtrack would not be significant.

Cumulative Analysis

Projects comprising the cumulative analysis within the project corridor, in addition to BART, include SFIA expansion plans, the Hickey Boulevard extension from Mission Road to Hillside Boulevard, and the *El Camino Corridor Redevelopment Plan.* Cumulative impacts would vary depending on the viewer's location. In the project corridor, the cumulative effect of the proposed project and SFIA expansion would be minimal, since these projects cannot be viewed simultaneously from close- or medium-range vantage points. However, there are distant views to the west from higher elevations that encompass the BART project corridor and the SFIA; from these vantage points, slightly less open space would be visible due to

the new facilities on SFIA property. Similarly, the portion of the Hickey Boulevard extension east of Mission Road could not be viewed in conjunction with the BART facilities. Consequently, the cumulative effects on visual resources at the SFIA and in the eastern part of South San Francisco would not be significant.

In contrast, in the vicinity of Hickey Boulevard, El Camino Real, and Mission Road, the Hickey Boulevard extension, development envisioned by the redevelopment plan, and the BART parking garage would dramatically alter the existing visual setting in South San Francisco. Now a large, vacant parcel, this area between Macy's and Kaiser Medical Center would become a medium/high-density, mid-rise development area. While this development would be consistent with the existing built environment, the overall area would become much more intensely developed than the surrounding residential and highway-oriented uses. The scale and height of the proposed facilities would obstruct northeasterly views of San Bruno Mountain from El Camino Real. These cumulative effects would be significant; however, through proper design, coordinated development plans, and consistent landscaping, these developments have the potential to contribute to a visually cohesive and integrated activity center. The loss of views of San Bruno Mountain would not be significant, because these views are intermittent from a motorist's perspective and are not considered high quality nor visually significant.

The undeveloped, natural appearances and views of the SFIA property west of the Highway 101 would be significantly altered by the aerial guideways for BART in combination with the new highway ramps into and out of the airport.

The visual effects of the Millbrae Avenue grade separation would cumulate with the Millbrae Avenue Station. Since there are no significant views, scenic resources, or sensitive receptors (within 60 feet), cumulative changes to the visual setting would be insignificant. There are no known projects that would add to visual impacts associated with the Aerial Design Option LPA in Burlingame.

Section 4
Cultural Resources

4.1 Introduction

This section presents a general description of potentially significant prehistoric and historic resources in the central portion of San Mateo County,[1] as well as potential effects to these cultural resources by the BART–San Francisco Airport Extension. The impact assessment has been conducted pursuant to Section 106 of the National Historic Preservation Act of 1966 and Appendices G and K of the CEQA Guidelines. The methodology for evaluating effects is described below under Impact Assessment and Mitigation Measures. Impacts addressed in this section are those that would occur during operation of the Aerial Design Option LPA. Impacts directly related to construction activities are addressed later in Section 3.13, Construction.

4.2 Existing Conditions

Significant Cultural Resources and Area of Potential Effects

The National Register of Historic Places (NRHP) contains an inventory of the nation's significant prehistoric and historic properties. Criteria for recommending properties for possible inclusion in the NRHP are identified below:

> The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that:
>
> A. are associated with events that have made a significant contribution to the broad patterns of history;
>
> B. are associated with the lives of persons significant in the past;
>
> C. embody the distinctive characteristics of a type, period, or method of construction, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> D. have yielded, or may be likely to yield, information important in prehistory or history.

For any proposed federal action, an Area of Potential Effects (APE) is defined. This APE encompasses the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties (36 CFR Part 800.2[2]). These changes can be either direct or indirect in nature. A specific APE has been delineated for the Aerial Design Option LPA (Figures 3.4-1, 3.4-2, 3.4-3 and 3.4-4) and includes the parcels abutting the project right-of-way and the adjacent properties that are on, or considered eligible for, inclusion in the NRHP.

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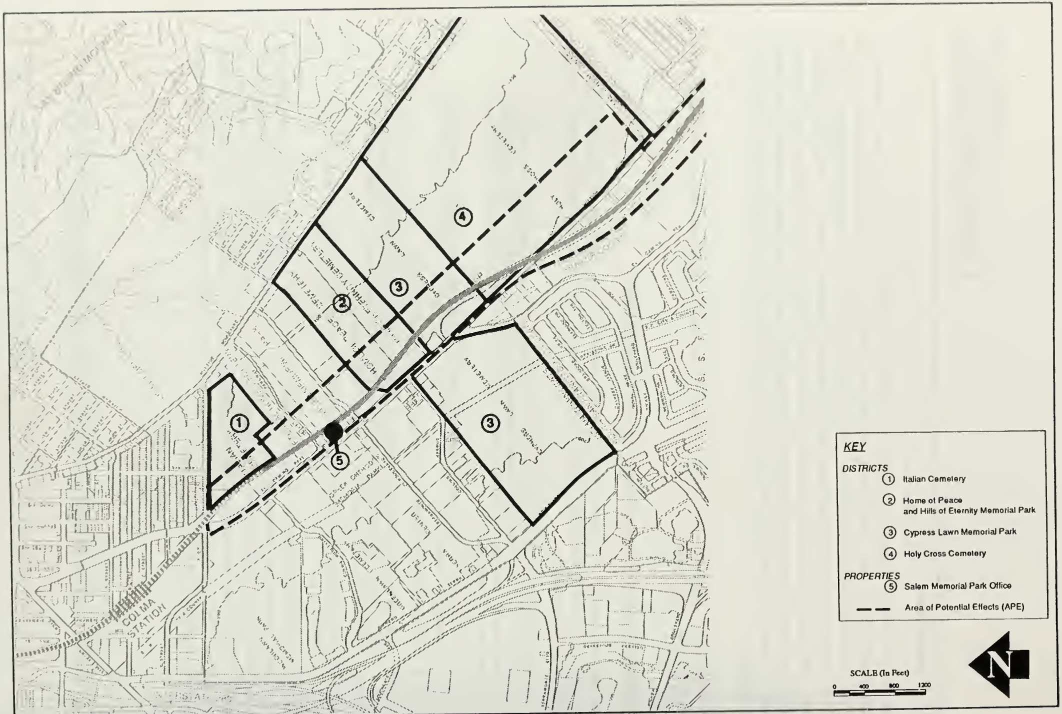
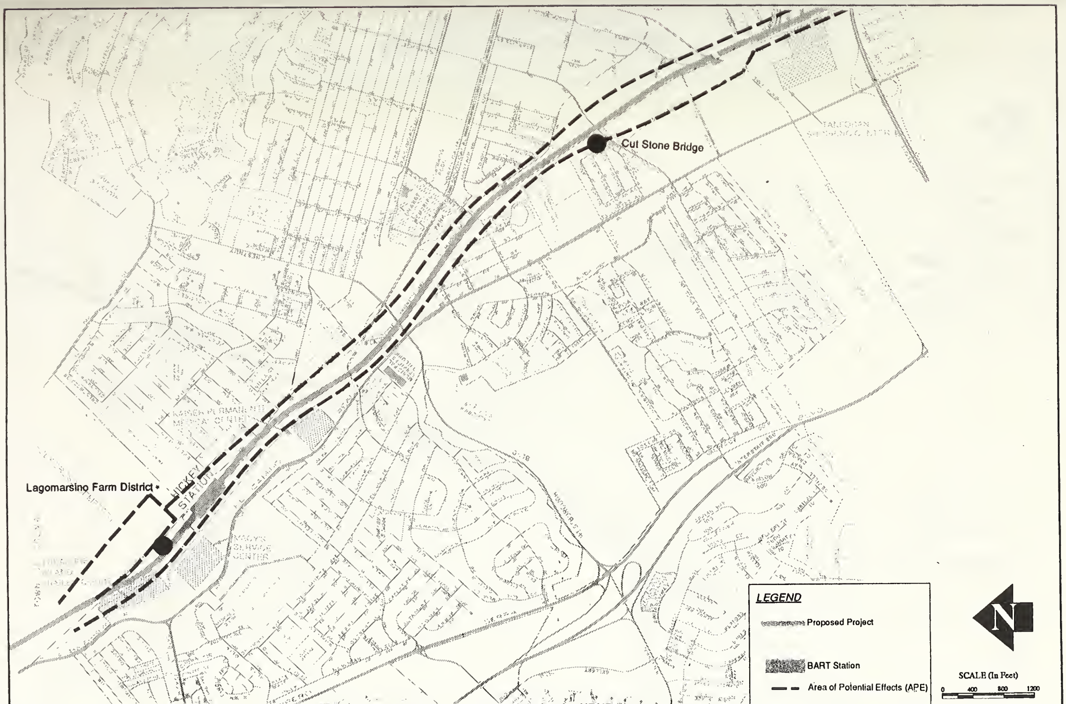
[1] For further reference, an Archaeological Survey Report, three Historic Architectural Survey Reports, and an Historic Resources Evaluation Report have been prepared and are available for review at BART offices at 1000 Broadway, Oakland, CA 94607.



OGDEN

Significant Historic Resources within APE Colma

FIGURE 3.4-1



* SHPO has indicated that there is insufficient information to consider this property eligible for the NRHP.

OGDEN

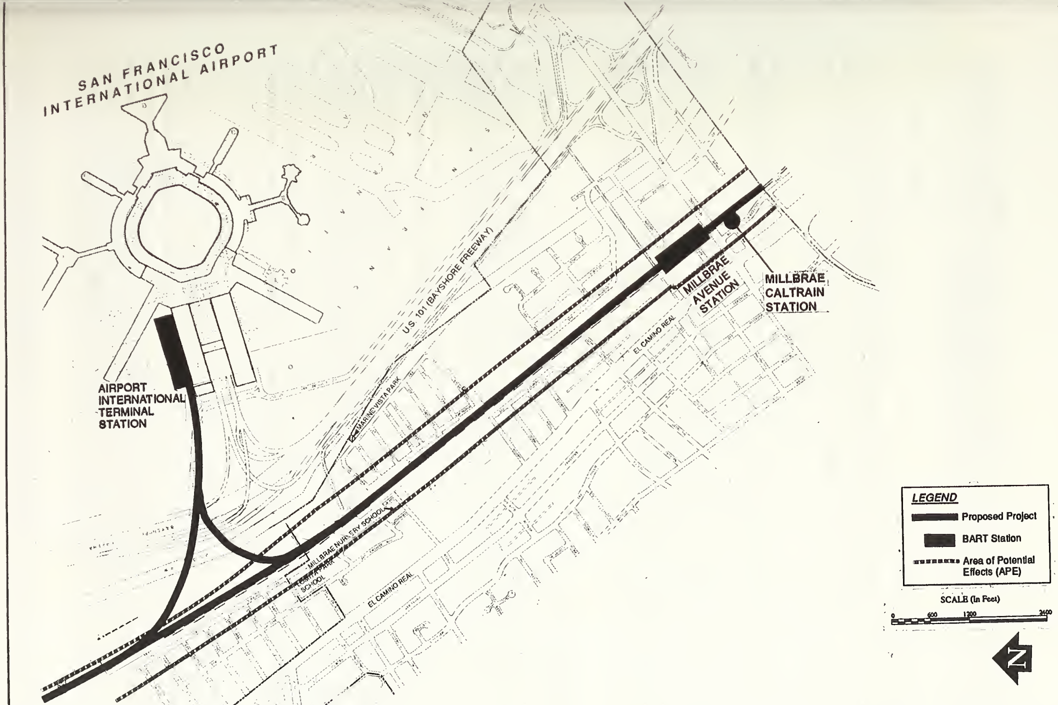
FIGURE 3.4-2

Significant Historic Resources within APE South San Francisco

OGDEN

Significant Historic Resources within APE San Bruno

FIGURE 3.4-3



OGDEN

Significant Historic Resources within APE Millbrae

FIGURE 3.4-4

Pursuant to Appendix K of CEQA, cultural resources must be evaluated for "uniqueness" or importance; evaluation criteria are comparable to the NRHP criteria described above. Cultural resources that are significant/important, based on the above criteria, are assessed for impacts.

Paleontological Resources

The paleontological resources of an area are a function of the types of sedimentary deposits present in the vicinity. The project corridor generally follows the former SPTCo railroad right-of-way from the Colma area to SFIA. Underlying the project corridor are the sedimentary deposits of the Colma Formation and the Merced Formation.

The Pleistocene-age Colma Formation is composed of a group of unconsolidated, sandy estuarine and coastal deposits. Although poorly documented, occasional small marine and nonmarine invertebrate fossils may be present in the Colma Formation.

The Pliocene- to Pleistocene-age Merced Formation consists predominantly of shallow marine and estuarine deposits of fine- to medium-grained sands, which are occasionally silty, clayey, or conglomeratic. Overall, the Merced Formation is highly fossiliferous. Gastropoda (snails) and bivalvia (clams, oysters, scallops, etc.) are the predominant fossils of the Merced Formation; however, the fossilized remains of bryozoans, barnacles and crabs, fish vertebrae, and unidentified burrows and worm tubes are also present (Bedrossian, 1974).

Archaeological Resources

Based on archival research, one prehistoric site was identified in the project corridor. This site, CA-SMA-299, was recorded in 1989 by Barbara Bocek of Stanford University during the San Francisquito Archaeological Project. She described the site as "a large midden with shell in patches of varying density, on [the] north and south banks of the creek." The integrity of the site was recorded as "completely destroyed, not only by creek channelization, railroad tracks and other construction but by systematic mining of the midden itself as 'Colma Loam,' sold as gardening soil in the 1930-1950s." Investigation and sampling performed for the *Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement* (DEIR/SDEIS) confirmed the absence of this resource in shallow areas where it was previously identified. Moreover, past disturbances in this vicinity suggest the site would not yield important information on prehistory or history and therefore would not satisfy Criterion D for NRHP eligibility or Appendix K criteria for CEQA importance. The State Historic Preservation Officer (SHPO) concurred, via a letter dated December 27, 1995, that the site has been destroyed and is not eligible for the NRHP (see Volume V for further discussion). Therefore, no additional investigation or testing will be performed on CA-SMA-299.

Historic Resources

The evaluation of structures within the APE considered the category of historic property (district, site, building, structure, or object); degree of importance at local, state, or national levels; appropriate theme; and period of significance. In addition, Criteria Consideration D, a special category of the NRHP significance criteria, was used to assess the cemeteries, which are properties not normally considered eligible for listing in the National Register. To qualify for the NRHP, cemeteries must meet one of

several special conditions, such as containing graves of exceptionally significant individuals or exemplifying distinctive design values. Within the APE for the Aerial Design Option LPA, a total of ten properties with potentially significant cultural resources were identified (see Figures 3.4-1, 3.4-2, 3.4-3, and 3.4-4 for their locations). The ten properties are as follows:

Cemetery Districts

- Italian Cemetery - 540 F Street, Colma
- Home of Peace Cemetery and Hills of Eternity Memorial Park Cemetery – 1299 El Camino Real, Colma
- Cypress Lawn Memorial Park Cemetery – 1370 El Camino Real, Colma
- Holy Cross Cemetery – 1500 Mission Road, Colma

Properties/Structures

- Salem Memorial Park Office Building – 1171 El Camino Real, Colma
- Old Colma Railroad Station – at northeast corner of Serramonte Boulevard and El Camino Real, Colma
- Lagomarsino Farm District/Residences – 1431-1457 Mission Road, Colma
- Arched, Cut-Stone Bridge – at South Spruce Avenue and Southern Pacific Railroad Line, South San Francisco
- 540 San Antonio Avenue, San Bruno
- Millbrae Train Station –21 East Millbrae Avenue, Millbrae

Of these resources, one property is already on the National Register (Millbrae Train Station), and one was previously found to be eligible (Old Colma Railroad Station). The SHPO concurred, in a letter to FTA dated April 18, 1996, that of the other eight properties, seven are eligible for the NRHP; the SHPO indicated that there was insufficient information to consider the Lagomarsino Farm District eligible. The SHPO's determination of eligibility can be found in Volume V of this FEIR/FEIS.

Description of Eligible Properties

Italian Cemetery District. This Colma cemetery, founded in 1899, embodies the distinctive aesthetic principles and values of the Southern European cemetery design in its plan, buildings, minimal natural plantings, funerary sculpture, grave markers, vaults, and mausoleums. Consequently, the cemetery is eligible for inclusion on the National Register as a district under Criteria Consideration D.

Home of Peace Cemetery and Hills of Eternity Memorial Park Cemetery District. These abutting cemeteries, developed in tandem during the period 1889-1945, form one district that is eligible for the National Register under Criteria Consideration D. Under this category, the cemetery would be considered a district of state-level importance with a landscape architectural theme. The cemeteries within this district contain the graves of persons significant in California's history, including clothier Levi Strauss and leading members of the Lilienthal, Zellerbach, Haas, Sachs, Fleishhacker, and Shilling families. This district also represents an excellent example of cemetery design of the period 1889 to 1945.

Cypress Lawn Memorial Park Cemetery District. This Colma cemetery qualifies as eligible for the National Register as a state-level district. It contains the finest collection of funerary art and architecture found in northern California and epitomizes the picturesque landscaping principles of the rural cemetery movement. It also reflects the evolution of American cemetery design from 1892 through the World

War II era. It contains the remains of more people who played outstanding roles in the economic, political, intellectual, and artistic history of California than any other cemetery in northern California, and perhaps the entire state. Examples of these individuals include pioneer Thomas O. Larkin; historian Hubert Howe Bancroft; bankers William C. Ralston, William H. Crocker, and Lloyd Tevis; and publishers William Randolph Hearst and Charles de Young. Consequently, the cemetery is eligible for inclusion on the National Register under Criteria A, B, and C and Criteria Consideration D.

Holy Cross Cemetery District. This Colma cemetery qualifies as eligible for the National Register as a state-level district. This cemetery is an excellent example of cemetery design for the period 1886-1945. It contains a fine collection of historic buildings, grave markers, and mausoleums, as well as the graves of persons significant in California's economic and political history (Governor John Downy, A.P. Giannini of the Bank of America, Mayor and Senator James Phelan, and Senator James Fair). Consequently, the cemetery is eligible for inclusion on the National Register under Criteria A, B, and C and Criteria Consideration D.

Salem Memorial Office Building. This building qualifies under Criterion C of the National Register. The property is a distinctive example of an Art Deco/Moderne-style building. Its plan, materials, proportions, and ornamentation are common features of this class of resource. It is not part of a larger district, since the rest of Salem Memorial Park does not have the qualities necessary for eligibility to the National Register. Finally, the integrity of location, design, setting, materials, workmanship, feeling, and association of the Salem Memorial Park Office Building contribute to the building's eligibility for inclusion in the NHRP.

Old Colma Railroad Station. The Old Colma Railroad Station (built in 1881) is temporarily in the APE. Formerly known as the Schoolhouse Station, it is a one-story board-and-batten structure with wide, overhanging eaves supported by curved wood brackets. This structure has been considered by the SHPO to be eligible for inclusion in the NRHP, not only for its rare architectural style but as a vestige of the gardening era of the Town of Colma. The station was temporarily moved into the APE to avoid potential damage associated with construction of the Colma BART Station. Because construction of the Colma BART Station has been completed, the Old Colma Railroad Station will be removed from its temporary storage location in the APE and would not be affected by development of the project.

Lagomarsino Farm District. This district consists of five houses and one farm building related to the Frank Lagomarsino vegetable farm on Mission Road in Colma. This district was judged eligible for the National Register by Kent L. Seavey in his Historic Resources Inventory, Town of Colma, California (1991). The SHPO, however, indicated that there was insufficient information to consider the property eligible.

Arched, Cut-Stone Bridge. This small stone bridge or culvert owned by SPTCo is located in the SPTCo right-of-way just north of South Spruce Avenue. It was constructed in 1863 to channel winter runoff under the old San Francisco-San Jose Railroad. The method of construction, materials used, and the plan, style, proportion, and form are distinctive. It is an important example of California building practices during the 1860s. As a result, the bridge is eligible for inclusion on the National Register under Criterion C.

540 San Antonio Avenue, Craftsman-Style House (c. 1915). This building is a very good example of an upper middle-class Craftsman house. While many houses in neighboring communities are comparable to 540 San Antonio Avenue, only a handful of houses in San Bruno display a similar scale and quality of

detail from this era. Consequently, the structure is eligible for inclusion on the National Register under Criterion C.

Millbrae Train Station. The Millbrae Train Station, also referred to as the Millbrae Southern Pacific Depot and the Millbrae CalTrain Station, is the one property in the APE that is already on the National Register. It consists of a two-story, wood-frame structure with a hipped roof of wood shingle materials. The building was constructed as a depot in 1907 by the Southern Pacific Railroad Company, with the lower floor containing features such as a baggage room, waiting area, and ticket window. It is typical of those built in the early 1900s with the Colonial Revival look. The importance of a railroad stop in Millbrae was highly significant to the growth and prosperity of the community; the small population of this area, originally a rancho, expanded greatly with introduction of the rail line. The building was nominated to the National Register of Historic Places in 1977 and was placed on the Register as "Southern Pacific Depot." The building was placed in the NRHP because it is associated with railroad events that made a significant contribution to the area (Criterion A). It also meets Criterion C because it embodies the distinctive architectural characteristics from the early 1900s.

4.3 Impact Assessment and Mitigation

Significance Criteria and Methodology

A project is considered to have an adverse project-specific or cumulative effect on cultural resources if it disrupts or adversely affects 1) a significant prehistoric or historic archaeological site, 2) a property of historic or cultural significance to a community or an ethnic or social group, or 3) a paleontological resource. In addition to direct physical disturbances to cultural resources, significant impacts also occur if a project diminishes the integrity of a property's location, design, historic setting, materials, workmanship, feeling, or association.

These criteria conform to the federal Section 106 criteria of effect on historic properties (36 CFR Part 800.9). Section 106 contains criteria to determine "effect" and "adverse effect" and is described below.

> "An undertaking has an effect on an historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register. For the purpose of determining effect, alteration to features of a property's location, setting, or use may be relevant depending on a property's significant characteristics and should be considered."
>
> "An undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects on historic properties include, but are not limited to:
>
> (1) Physical destruction, damage, or alteration of all or part of the property;
>
> (2) Isolation of the property from or alteration of the character of the property's setting when that character contributes to the property's qualification for the National Register;
>
> (3) Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;
>
> (4) Neglect of a property resulting in its deterioration or destruction; and
>
> (5) Transfer, lease or sale of property."

The application of these criteria of effect to the nine eligible properties and districts resulted in a:

- Finding of Adverse Effect for the arched, cut-stone bridge; and
- Finding of No Effect for the other eight historic properties/structures.

A Finding of Effect (FOE) was prepared and forwarded to the SHPO. The SHPO concurred with the FOE, in a letter dated April 18, 1996, and the Advisory Council on Historic Preservation (ACHP) was notified in accordance with 36 CFR Part 800.5. The complete documentation concerning the application of these criteria and results are presented in Volume V of this FEIR/FEIS.

Pursuant to CEQA guidelines of significance, the only identified significant adverse impact would be the removal and reconstruction of the arched, cut-stone bridge in South San Francisco.

Project-Specific Analysis

The text below reflects potential impacts to paleontological resources and to resources already on, or potentially eligible for, the NRHP. Operational impacts to the cemetery properties would be long-term or expected to occur during BART revenue service. Potential construction-related impacts to the cemeteries and the other historic resources eligible, or potentially eligible, for the NRHP in the project APE are assessed later in Section 3.13, Construction.

Paleontological Resources

1. *The Aerial Design Option LPA would have no significant long-term effect on sensitive paleontological resources. (I)*

   Fossiliferous deposits may be disturbed during the construction period. This effect is not considered significant because the deposits are commonplace in the Merced Formation and the potential for encountering them is low to moderate in the Colma Formation. Consequently, disturbance to these resources would not be considered significant (see Section 3.13, Construction, later in this chapter for more details).

Properties/Structures

2. *The Aerial Design Option LPA would have no effect on the Old Colma Railroad Station, as it is temporarily located within the APE on leased property and will be moved prior to construction for the BART–San Francisco Airport Extension. (I)*

   The Colma Railroad Station was temporarily located in the APE for the BART–San Francisco Airport Extension to avoid potential impacts from construction of BART Colma Station. Because the BART Colma Station construction is complete, BART must remove the station from this temporary location. An FOE was prepared for a transfer of title, and BART has entered into a Memorandum of Agreement (MOA) with the Town of Colma, the SHPO, and the FTA which was the original funding agency for purchase of the station. Under the terms of this MOA, the station must be relocated to a permanent location outside the APE.

   The proposed project would therefore have no effect on the Colma Railroad Station because it would be relocated outside the project prior to initiation of construction for the BART–San Francisco Airport Extension.

3. *The Aerial Design Option LPA would result in the removal and reconstruction of the arched, cut-stone bridge in South San Francisco, since it lies within the proposed right-of-way. (S)*

Construction of the BART subway alignment in the vicinity of South Spruce Avenue in South San Francisco would result in a significant effect to the arched, cut-stone bridge, because it would require the physical removal and reconstruction of the structure.

Alternatives to removal and reconstruction of the arched, cut-stone bridge were examined during preparation of the FEIR/FEIS. These included:

- Relocating the project alignment to the east or west to avoid the bridge. This alternative would require removing the BART track from the existing railroad alignment and would result in costly right-of-way acquisition and possible displacement; greater disturbance to the seasonal wetland north of South Spruce Avenue and west of the SPTCo tracks; and possibly greater groundborne noise and vibration effects to adjacent land uses on either side of the alignment.
- Suspending the bridge while performing construction underneath. This alternative was concluded to be a safety hazard because of the weight of the structure. Furthermore, the integrity of the bridge may not have withstood vibration or other subsurface activity while in suspension.
- Replacing the entire bridge. This alternative was rejected because the amount of reinforcement necessary to bring it into compliance with the South San Francisco building codes would not allow for reconstruction without significant alteration. Since the bridge is now connected to and hidden by existing infrastructure for South Spruce Avenue and the culvert system, this type of replacement would not be practical and would not likely expose any additional views of the bridge.

MITIGATION MEASURES. The proposed mitigation for the adverse effect to the arched, cut-stone bridge includes dismantling the bridge and reconstructing the visible headwall in approximately the same location. The new bridge may be somewhat wider, but reconstruction would allow for the currently visible headwall to remain. The appearance of the arched, cut-stone bridge as it is seen looking northeast from South Spruce Avenue would be restored, and the existing visual aspects of the structure would be preserved. The following specific measures, which are included in an MOA among BART, SamTrans, FTA, SHPO, and the Advisory Council on Historic Preservation specifying the conditions under which the bridge may be disturbed, would reduce the impact to an insignificant level.

3.1 *Recordation.* Prior to the removal of this bridge, it will be recorded as part of the National Park Service's Historic American Engineering Record.

3.2 *Dismantle and Reassemble Headwall.* The visible headwall of the bridge will be dismantled under the supervision of a professional stonemason, and the stones will be piece-marked so that they can be reassembled with the original placement of stones under the direction of the stonemason.

The northern side of the bridge is now buried and possibly connected to an underground culvert; parts of the bridge also appear to be buried within the infrastructure of South Spruce Avenue. Contractors will be required to excavate the buried northern side of the bridge so that the headwall will not be damaged. Therefore, prior to construction, the stonemason or other consultant qualified in historic excavation, under direction of the Mitigation Monitor, will inspect the bridge area and will consult with contractors to determine if the headwall exists and/or which construction activities should be undertaken to determine its existence. If

the north headwall does exist, the contractor and stonemason will verify how and if the headwall can be removed without damage to the stones or existing infrastructure and if the north face can be reconstructed to be visible given existing infrastructure. The stonemason and/or contractor will be required to report on these conclusions as part of the mitigation monitoring process.

If the north headwall remains intact and it is feasible, dismantling and reassembly will occur in the same manner as the southern wall. If after excavation, stones are found but cannot be included in the reconstructed bridge due to their condition, adjacent infrastructure, or BART design, BART will contact the City of South San Francisco and historic societies specializing in railroad and local history. The remaining stones would be donated to these organizations for historic purposes.

3.3 *Construct Bridge Replica.* A new bridge will be constructed of concrete, in compliance with current engineering standards and codes. The original headwall will be reconstructed in its original position, if possible, so that the resulting new bridge will look virtually the same as the original.

3.4 *Provide Historical Bridge Marker.* BART will provide a marker or display identifying the bridge location and its historical significance. BART, SamTrans, and other members of a bike path planning committee, if established, will coordinate to integrate the bridge into a bike path, if implemented. This effort would include incorporating this marker display as part of the bike path.

4. *The Aerial Design Option LPA would require relocation of the Millbrae Train Station platform to accommodate the BART tracks. (I)*

Based on additional engineering performed in this segment during preparation of the FEIR/FEIS, the Millbrae Railroad Station would not need to be relocated as previously described for Alternative VI. The Millbrae Avenue BART/CalTrain Station would be built in Millbrae and would accommodate cross-platform transfers between BART and the existing northbound CalTrain track. With development of the station, the platform center for both BART and CalTrain passenger loading would be located approximately 650 feet north of the existing Millbrae Train Station. The existing CalTrain platform used in conjunction with the historic station would be shifted north to be integrated with the new BART station. As a result, the southernmost edge of the platform would be approximately 200 feet north of the historic station, instead of the center of the platform being located in front of the station.

Even though the loading platform would shift, the overall use of the Millbrae Train Station would continue unaffected. Portions of the existing parking area, which extends several hundred feet south of the Millbrae Train Station, would be retained for CalTrain patrons. Passengers parking south of the historic station would still pass the station to access the train platform. CalTrain patrons could continue to park south of the Millbrae Train Station, pass the station building, and walk north to the new CalTrain platform.

The Aerial Design Option LPA would not have a direct effect on the Millbrae Train Station, since it would remain in its existing location. Creation of an intermodal station for CalTrain and BART to the north would not alter the use of the property and would not affect the qualities that make it eligible for the National Register. The setting would be somewhat altered as the existing adjacent

platform is shifted north; in general, however, surrounding activities that characterize active use of the station (such as the waiting area, adjacent track, parking, commercial uses, and ticket sales) would not be altered. Because the BART facilities would be constructed at grade and east of the existing CalTrain track, the temporary construction impacts (noise and dust) would not result in a long-term impact to the setting or use of the station.

5. *The Aerial Design Option LPA would introduce a new visual element into the setting of 540 San Antonio Avenue in San Bruno, a property near the alignment that is considered eligible for inclusion in the NRHP. However, this change would not significantly alter the character of the property's setting. (I)*

   A Craftsman-style house at 540 San Antonio Avenue, San Bruno, on the west side of the street, is eligible for inclusion in the National Register. As part of the project, a sound wall would be located on the east side of San Antonio Drive between the CalTrain mainline and the BART tracks to screen residences along Huntington and San Antonio Avenues from excessive noise associated with BART train operations. This sound wall would be partially visible through the existing trees that lie west of the CalTrain tracks. The sound wall would not be expected to block views since removal of mature eucalyptus trees which contribute to the attractive streetscape would not be necessary. Because the wall would be located across the street from the residence (about 175 feet east of the property), the setting immediately surrounding the structures would not be compromised, and the project would have no direct effect on the structure or adjacent structures.

Cumulative Analysis

In South San Francisco, the proposed project and South San Francisco redevelopment plan would not generate significant cumulative effects, since the *El Camino Corridor Redevelopment Plan Draft EIR* indicates that redevelopment activities would not result in any direct effects on cultural resources. No other projects have been identified which, with this project, would result in cumulative adverse effects to cultural resources in the project corridor.

Section 5
Community Services and Facilities

5.1 Introduction

This section discusses the community services, facilities, and utilities that could be affected by the BART extension. This section addresses potential impacts to police, fire, emergency medical, water supply, and wastewater treatment services that would occur during operation of the Aerial Design Option LPA. Section 3.7, Hydrology, also includes a discussion of groundwater and BART's effects on this source of water supply. Electric utility services are discussed in Section 3.12, Energy. Impacts that are directly related to construction activities are addressed in Section 3.13, Construction.

Loss of access to other public services, such as libraries, schools, and parks, and other potential impacts, such as land use displacement, are discussed in Section 3.2, Land Use. The demand for these services would remain unaffected by BART service and are therefore not discussed in this section.

5.2 Existing Conditions

Local Services

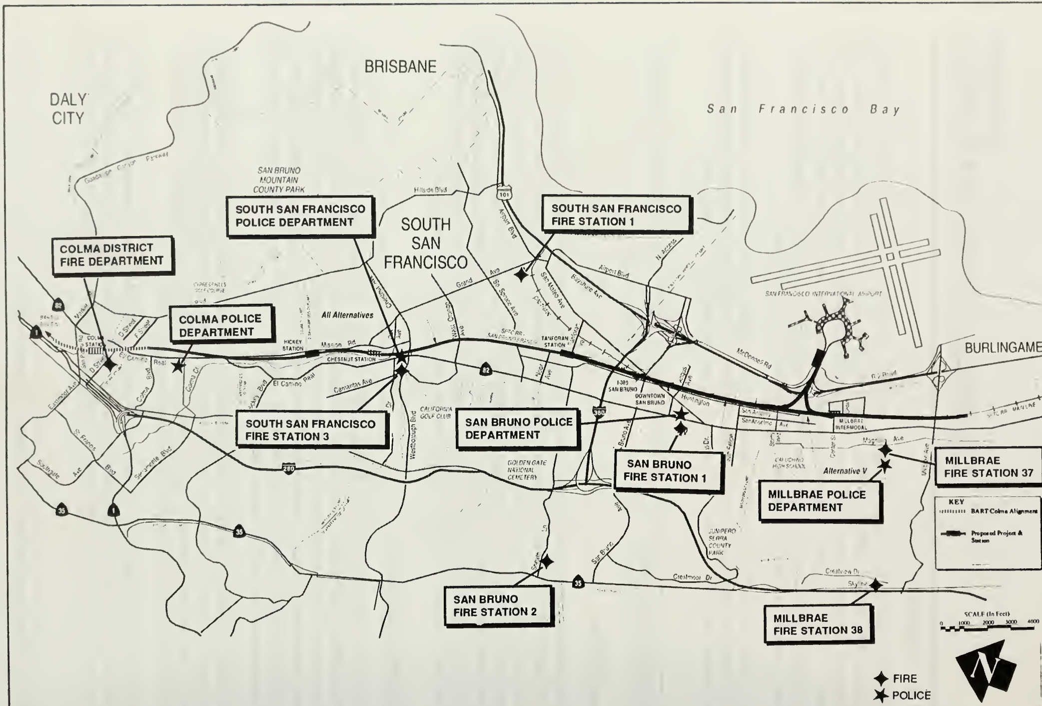
Local community services and utilities provided in the project corridor are shown in Figures 3.5-1a and 3.5-1b and Table 3.5-1. Each city currently maintains adequate service for the existing level of police calls (Chief Dollosso, 1993; Sergeant Petrocchi, 1993; Captain Gibson, 1993; Detective Fitts, 1993; Chief Palmer, 1994). Likewise, each of the fire departments currently has a full staff and can maintain adequate fire and emergency medical service for the existing level of calls (Chief Mullins, Marshall Lagomarsino, Chief Dawson, Chief Kelly, 1993; Chief Towns, 1994). Water supply and wastewater treatment facilities are currently adequate to handle the existing demand generated by the local jurisdictions.

BART Police Services

BART police handle all crimes that occur on BART property. As signatories to the California Mutual Aid Agreement (coordinated by the Office of Emergency Services), the BART police have a mutual aid agreement with all police departments located along the BART system. BART often calls on neighboring police departments to assist in medical emergencies or serious crimes requiring immediate response or additional resources. Calls to local police for assistance could occur several times a week with implementation of the BART extension (Singer, 1993).

The majority of incidents handled by BART police are property crime (i.e., auto thefts and burglaries). More serious crimes are seldom reported. Most police incidents involving BART occur at stations, in parking lots, and on platforms; very few are reported on trains. Problems that occur along the right-of-way mainly involve juveniles throwing rocks (Singer, 1993).

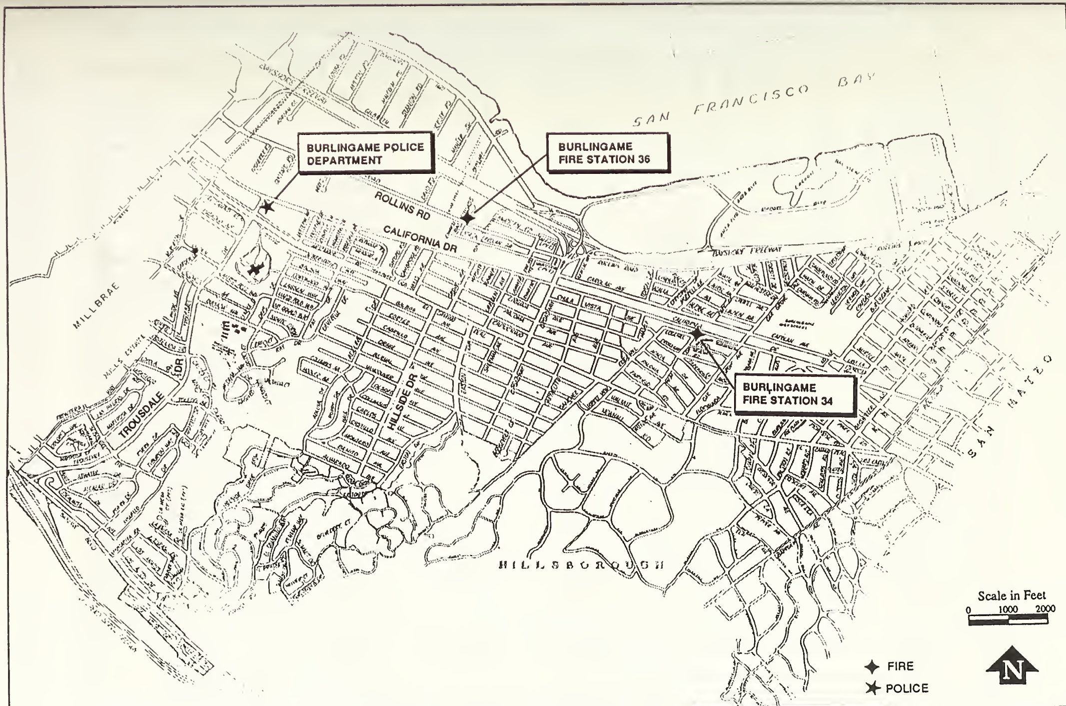
BART Police Department has a current authorized strength of 162 sworn personnel, organized for around-the-clock coverage. BART police operate with a combination of patrol methods, patrolling both in vehicles and on board trains. In addition to uniformed beat officers, BART police have a complement



OGDEN

Police and Fire Department Locations

FIGURE 3.5-1a



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Police and Fire Department Locations

FIGURE

3.5-1b

Table 3.5-1
Local Community Services and Utilities in the Project Corridor

	Colma	South San Francisco	San Bruno	Millbrae	Burlingame	SFIA
POLICE						
Staffing (sworn officers)	12	73	50	25	45	167
Response Time (minutes)	1	2-3	3	2.5	<3	1.5-2
FIRE/EMERGENCY MEDICAL						
Closest station to BART (mile)	1/4	1/4	1/4	1	3/4	1/2
Staffing (firefighters)	35	24	24	23	45	17
Response Time (in minutes)	2-3	4	3	3-4	≤4	minimal (onsite)
Monthly Calls for Service	35 for district	326 for department	156 for nearest station	98 for nearest station	193 for department	191 for department
WATER						
Supplier	California Water Service Co.	California Water Service Co.	City Department of Public Works purchases from SF Water Department	City Department of Public Works purchases from SF Water Department	*	SF Water Department
Allocation	Not Applicable	Not Applicable	3.08 mgd	2.1 mgd	*	1.7 mgd
WASTEWATER						
Treatment	North County Sanitation District; South San Francisco/San Bruno Joint Sewer Facilities	South San Francisco Joint Sewer Facilities	South San Francisco Joint Sewer Facilities	Millbrae Wastewater Treatment Plant	*	SFIA
Capacity	.94 mgd	9 mgd	9-13 mgd	3 mgd	*	2.2 mgd
Current Flow (Average Dry Weather)	.047 mgd	7.5 mgd	7.5 mgd	2 mgd	*	1.69 mgd

Source: Ogden; SFIA Master Plan.
* No water-consuming or wastewater-generating BART facilities proposed in this jurisdiction

of undercover officers to make arrests for in-progress criminal activities. BART also employs revenue guards who drive and guard the trucks that collect money from the stations. The most recent addition to the BART police department is the employee category of Community Service Assistants. These non-sworn police employees provide patrol in BART parking structures, issue parking citations, staff the police zone facilities, and provide assistance to sworn personnel to increase the officers' efficiency. The average non-emergency response time for BART's police department is approximately ten minutes and response time for emergencies is less than eight minutes.

BART Emergency Response Plan

BART's emergency response procedures are contained in the *San Francisco Bay Area Rapid Transit District Emergency Response Plan* (BART, 1981). The plan is designed to "set forth the policy and guidelines for the emergency procedures that will be implemented by BART and other responding agencies whenever a life threatening situation occurs on or adjacent to the BART system."

BART is currently negotiating with each jurisdiction in the project corridor to enter into a "San Francisco Bay Area Rapid Transit District Emergency Procedures Policy, Vital Fire Protection Equipment, Communications, and Training Agreement." A liaison would be designated to serve on the BART Fire Liaison Committee and attend bimonthly coordination meetings with BART Safety Department and staff. The agreement stipulates that local fire departments will respond to BART emergencies and also specifies the general responsibilities of participating fire departments and BART. Under the agreement, BART is responsible for furnishing training manuals and exercises to improve proficiency in handling BART emergencies. In addition, BART provides equipment, maintained by each affected jurisdiction, for use in BART fire emergencies.

5.3 Impact Assessment and Mitigation

Significance Criteria and Methodology

Significance Criteria. Public services are an integral part of a community's quality of life, and to the extent that these services are adversely affected by a proposed project, people's perceptions of the project are greatly influenced. A proposed project that detracts from the quality and level of community services can certainly be classified as imposing a significant community effect. The definition of a significant effect, however, under CEQA and NEPA is more narrowly drawn. In order for the effect to be characterized as significant, it must trigger a substantially adverse consequence on the environment. The fact that a project results in increased demand for staffing is not sufficient to classify the effect as significant. Such classification would require that the shortage of staff resources involve an environmental effect. For example, this might occur if a facility were required to accommodate the additional staff and construction of the facility resulted in a substantial change to the environmental setting. This definition of significance under CEQA is different than that applied in the DEIR/SDEIS and the FRDEIR/S#2DEIS, but has been reaffirmed in a 1995 State Appeals Court decision, Goleta Union School District v. Regents of the University of California.

With this discussion as background, the Aerial Design Option LPA would cause a significant project-specific or cumulative impact if its implementation required new emergency response facilities, such as a

police substation or fire station, in order to accommodate a projected increase in staff demand; resulted in delayed response times and thereby created a hazardous situation; resulted in dry-weather wastewater flows that exceeded wastewater treatment capacity and thereby created the need for a plant expansion; or generated water demand in excess of the local water provider's capacity, thereby requiring development of new water supplies.

Methodology. Telephone interviews were conducted with city staff in the project corridor regarding the potential need for additional police, fire, emergency medical, wastewater, and water services, if BART were extended south from Colma. Whether an increased demand for police, fire, and emergency medical services could be accommodated without additional staff or equipment is difficult to determine. Input from jurisdictions with existing BART stations was useful in assessing potential impacts to police and fire departments within the project area.

Police and fire departments in three cities — Daly City, Richmond, and El Cerrito — were consulted regarding their respective experiences with BART. These stations were chosen because of their high levels of activity. The Daly City and Richmond Stations have higher usage than most stations because they are terminal stations with greater parking availability; the El Cerrito Del Norte Station is heavily used due to freeway accessibility. These police and fire departments were considered to represent realistic but conservative scenarios in terms of potential impacts to police and fire service.

Domestic and landscape water usage rates from the El Cerrito Del Norte Station were used to estimate potential water demands for the proposed BART stations along the BART–San Francisco Airport Extension. Located in El Cerrito, this station is similar to the proposed stations in number of restroom facilities, landscape irrigation, and climate. Water demand at this station is likely greater than most of the proposed stations, due to the typically warmer weather in the East Bay; thus, the average water demand for this station of 4,300 gallons per day (gpd) represents a conservative assumption. Separate figures for domestic and landscape consumption were not available, and estimates are based on the combined water usage.

The estimated daily wastewater generation is a factor of domestic water consumption. It is conservatively assumed that all water consumed is conveyed to the wastewater treatment plant, although water used for irrigation, for example, is not treated.

The cumulative analysis of potential impacts to community services is based on the impacts of the proposed BART extension, ABAG's population growth projections, the SFIA expansion, and the *El Camino Corridor Redevelopment Plan*. ABAG's *Projections '94* are shown in Table 3-1 at the beginning of this chapter.

Project-Specific Analysis

Local Police, Fire, and Emergency Services

1. *The Aerial Design Option would result in a minimal increase in the demand for local and BART emergency response staff. (I)*

   Each police department in the jurisdictions with existing BART stations indicated that BART facilities bring an increase in local traffic volumes and parking demands, an increase in calls when BART police are unavailable, and a minimal increase in calls for service. In each of the

communities with existing stations, these calls are currently handled by the police departments, without an increase in staff or equipment (Commander Mendiara, Sergeant Ritter, Sergeant Hurley, 1993).

The Hickey Station would generate an increase in calls for service for South San Francisco police and fire departments. Similarly, San Bruno would be called upon to serve the Tanforan Station. The Millbrae police and fire departments would also experience an increase in calls for service from the proposed Millbrae Avenue Station.

In addition, SFIA police and fire departments would experience an increase in calls for service from the proposed Airport International Terminal Station beyond that indicated in the SFIA Master Plan Final EIR. According to the Final EIR, the SFIA police and fire departments would already require additional staff to meet the projected short- and long-term needs of the SFIA.

The calls for police services are expected to be minimal, in part due to the *BART District Facilities Safety Criteria*, which define a number of preventive and protective measures that will be incorporated into project design. These design criteria will minimize the potential for accidents at stations, aboard trains, and in other areas of the system, and reduce the need for local police department assistance. BART will implement the following requirements into station construction specifications:

- clear signage;
- clear, distinct routes for pedestrian and vehicle access;
- landscaping that does not result in unsurveyed areas;
- non-slip walking surface material; and
- adequate lighting in stations and parking lots.

In addition, BART will provide emergency exits, stand-by electrical power supplies, alarm systems, and emergency communications systems, in accordance with the facilities safety criteria. Nevertheless, because of the uncertainty with respect to the actual demand and the local ability to respond to calls, the demand for police services is conservatively assumed to be a potentially significant effect.

The fire departments in South San Francisco , San Bruno, and Millbrae would likely experience an increase in the number of service calls similar to that in other communities serviced by BART stations, i.e., a demand that could be accommodated with existing personnel and equipment. BART will implement the following measures and safety features from the *BART District Facilities Safety Criteria* to minimize the potential for accidents in stations, aboard trains, and in other areas of the system, and to reduce the need for local fire department assistance. These protective and preventive design measures include:

- low combustion or non-combustible materials;
- fire sprinklers and standpipe installations;
- smoke and gas detectors;
- alarm systems;
- adequate exits and other emergency provisions for safety walkways; and
- exits and cross passages for safe egress to an adjacent tunnel should a fire occur.

Given the experience in other communities where BART service is currently operational and given the preventative measures to be adopted by BART as part of the project, the Aerial Design Option LPA would not be expected to create a demand for local staffing and resources that would warrant construction of a new facility. Accordingly, the community service effect of BART service on project corridor communities would be insignificant.

MITIGATION MEASURES. Although the Aerial Design Option would not result in significant community services impacts pursuant to CEQA or NEPA, local jurisdictions would be concerned about the increased demand for local police, fire, and paramedic response. The ability of local agencies to respond to this change in service calls will depend on their individual circumstances, including the city budget, service standards, and proximity of existing facilities. The following suggestions are measures that could be considered by local communities to address this effect:

- restructuring local police beats;
- shifting responsibility for administrative police tasks to civilians;
- encouraging neighborhood crime surveillance programs;
- station or substation relocation to improve response;
- onsite fire protection devices; and
- interlocking signal light systems to facilitate emergency response.

2. *Emergency response times to the Bayside Manor neighborhood could improve under the Aerial Design Option LPA. (B)*

A beneficial effect of a BART station at Millbrae Avenue is that Hillcrest Boulevard would be grade separated from CalTrain and the BART alignment and would connect El Camino Real with Aviador Avenue, which could improve emergency response times to the Bayside Manor neighborhood.

3. *It may be necessary to evacuate passengers during an emergency. Evacuation could be into unfamiliar surroundings or directly onto the aerial walkway. While passenger safety may be threatened during these emergencies, existing response procedures would provide for personal safety and security. (I)*

The BART Emergency Plan (1994) and Train Operators Manual (1983) identify procedures for safe evacuation from all potential evacuation sites, including aerial structures and underground between stations. The plan stipulates that local fire department services will be requested to respond during passenger emergency evacuation of BART trains.

BART Police

4. *The Aerial Design Option LPA would result in an increased demand for BART police service, requiring additional officers and equipment. These potentially significant impacts to police services would be avoided with implementation of BART's standard operating procedures, which include appropriate staffing and equipment, provision of BART's emergency response plan to jurisdictions, and review of station layouts to deter accidents and crime. (I)*

Additional BART police staff and equipment would be required to provide an appropriate level of service to the proposed extension (Sgt. Singer, 1993). Additional equipment required for the

proposed extension includes police vehicle(s), radio transmission stations, portable radios, uniforms, office equipment, and substations.

As part of the proposed project, BART will increase police staff and acquire additional equipment in an effort to improve the average response time for emergency and non-emergency calls. BART will provide local jurisdictions and SFIA police with its emergency response plan to inform them of emergency procedures and of local jurisdictions' responsibilities in such situations. Because most criminal activity investigated by BART police is concentrated in station areas and parking lots and involves attempted auto thefts and station vandalism, BART police will review the plans for station layout, parking, lighting, signage, and security systems in order to deter potential for criminal activities.

Water and Wastewater

5. *The Aerial Design Option LPA would generate an estimated demand of 17,900 gpd and an equivalent amount of wastewater. (I)*

The Aerial Design Option LPA includes stations in South San Francisco, San Bruno, Millbrae, and at the SFIA. Each station would generate a demand of about 4,300 gpd. In addition, a train car wash facility would be located in Colma at the Daly City Shop/Yard. The car wash would consume 700 gpd on average. These volumes would not result in significant water or wastewater demands on any of the affected jurisdictions because they represent such a small percentage of the total supply.

Each BART station is anticipated to consume a similar amount of water to the station selected to represent the most conservative average consumption, described earlier under "Significance Criteria and Methodology." The four proposed stations, including station area landscaping, are anticipated to consume a total of 17,200 gpd.

A train car wash facility would be located in Colma at the Daly City Shop/Yard. A typical car wash facility washes an average of 400 cars per week and uses approximately 10 gallons per car, or 570 gpd of water. In addition, a total of 12,000 gallons of water are used to flush the car wash system during each three-month period, or an average of approximately 130 gpd (BART, 1989). Thus, the car wash would consume approximately 700 gpd.

Total water consumption for four stations and a car wash would be approximately 17,900 gpd. The California Water Services Company, which serves the City of South San Francisco, foresees no difficulty in serving the one proposed BART station at Hickey Boulevard with approximately 4,300 gpd of water (Gravelle, 1993) and the car wash in Colma (Volonte, 1996). The City of San Bruno buys water from the San Francisco Water Department (SFWD); since only half of the city's allocation was purchased in 1992 (1.63 million gallons per day [mgd]), the approximately 4,300 gpd of water needed to serve the Tanforan Station is available without significant impacts to committed entitlement (Ritzman, 1993).

The station proposed on SFIA property would consume approximately 4,300 gpd of water. According to the SFIA Master Plan Final EIR, the SFIA projects water demand at approximately 2.1 mgd in 1996 and 2.4 mgd in 2006. The SFWD has indicated that it could supply the SFIA's projected demand. The BART station would require a negligible amount of water (4,300 gpd, or about 0.2 percent of project 1996 demand) and would not result in a significant impact. Similarly,

wastewater generation of about 4,300 gpd would result under this alternative; since the SFIA's wastewater treatment plant has more than 0.5 mgd of remaining capacity (as of 1992), no significant wastewater impacts are anticipated.

One station, requiring a total of 4,300 gpd, would be located in Millbrae. The city purchased 2.1 mgd of water from SFWD during fiscal year 1992-1993, 30 percent less than Millbrae's yearly contracted entitlement. An increase of 4,300 gpd (or 0.2 percent of the 2.1 mgd purchased in 1992-1993) is considered negligible and would not result in a significant impact to the Millbrae Wastewater Treatment Plant, since the plant currently (as of 1993) has about 1 mgd of remaining capacity.

Cumulative Analysis

An analysis of potential cumulative impacts to community services is based on projections of future population growth in the project corridor, in conjunction with the anticipated demands of the proposed project, the SFIA expansion, and the *El Camino Corridor Redevelopment Plan.* ABAG's *Projections '94*, used to determine population growth, is presented at the beginning of this chapter. Public service demands are assumed to increase at a rate proportional to population growth in each city. City budget conditions, community service standards, and surplus entitlements of water and wastewater treatment vary among cities and are indicators of whether cumulative impacts may be significant. The demands on services resulting from future growth will affect each city differently, depending on these variable circumstances; therefore, it is speculative to predict whether future cumulative demand would adversely affect service delivery. The presentation below highlights estimated increases in demand and assigns a significance classification when it is clear that the effect could be potentially significant. In instances where no significance classification is given, the cumulative effects of increased service demand in conjunction with BART-generated service demand would be too speculative to calculate.

Colma. Demand for community services in Colma would increase by approximately 28 percent by 1998 and 42 percent by 2010. With this anticipated increase in demand for services in the future, any additional demand created by the BART extension would be considered negligible.

Water and wastewater treatment demand in Colma in 1998 would be approximately 0.19 mgd and in 2010 approximately 0.21 mgd. This volume of wastewater is less than the town's allotment of treatment plant capacity at the North County Sanitation District and Joint Sewer Facilities and therefore would not adversely affect wastewater treatment services. BART would not contribute to cumulative water demand in Colma because no station is proposed.

South San Francisco. Demand for community services in South San Francisco would increase by approximately 4 percent by 1998 and 9 percent by 2010. With this anticipated increase in demand for services in the future, any additional demand created by the BART extension would be considered negligible.

Water demand in South San Francisco would be 7.05 mgd by 1998 and 7.4 mgd by 2010. The current entitlement contract with the California Water Services Company is in effect through 2009 and allows for 42.3 mgd of water. The entitlement would be sufficient to accommodate the cumulative demand.

Wastewater generation is conservatively estimated at 7.05 mgd by 1998 and 7.4 mgd by 2010. This flow would be combined with the projected 4.98 mgd in 2010 from San Bruno and 0.04 mgd from Colma,

since these cities are served by the South San Francisco Joint Sewer Facilities treatment plant. The City of South San Francisco has reevaluated the facility's wastewater capacity and current flows. The results are contained in a report, dated October 1995, entitled *City of South San Francisco, San Francisco, San Bruno Wastewater Treatment Facility - Final Report.* Results of this study confirmed the total design capacity to be 9.0 mgd. Based on the results of this test, the cumulative development plus BART would adversely affect wastewater treatment services, resulting in a significant cumulative impact.

San Bruno. Demand for community services in San Bruno would increase by approximately 5 percent by 1998 and 6 percent by 2010. With this anticipated increase in demand for services in the future, any additional demand created by the BART extension would be considered negligible.

Water demand in San Bruno in 1998 is estimated at 4.93 mgd and in 2010 at 4.98 mgd. These projections exceed the city's 1993 allocation from SFWD. San Bruno would need to renegotiate its entitlement with SFWD, rely more heavily on groundwater, or secure other sources of water. With the addition of the proposed project, water demand would increase by approximately 8,500 gpd. This increase would add to the potentially significant cumulative demand for water.

Wastewater generation in 1998 is estimated at 4.93 mgd and at 4.98 mgd in 2010. These future flows would be combined with South San Francisco's and Colma's, since all three cities are served by the South San Francisco/San Bruno Joint Sewer Facilities treatment plant. As noted above, these future demands would exceed the plant's capacity.

Millbrae. Demand for community services in Millbrae would increase by approximately 2 percent by 1998 and 3 percent by 2010. With this anticipated increase in demand for services in the future, any additional demand created by the BART extension would be considered negligible. Water demand in 1998 is estimated at 2.14 mgd and in 2010 at 2.16 mgd, which is still approximately 30 percent less than the city's 1993 water supply assurance.

San Francisco International Airport. The proposed Airport International Terminal Station's water demands combined with SFIA's estimated long-term water demand of 2.4 mgd would result in an increase of 41 percent over the current 1.7 mgd. According to the SFIA Master Plan FEIR, the SFWD may be able to meet the SFIA's long-term demand, but water conservation measures could be necessary. As a result, the cumulative development at the SFIA with the implementation of the Aerial Design Option LPA would be potentially significant. The SFIA plans to add 0.8 mgd to the sewer capacity; with a new capacity of 3.0 mgd, the wastewater treatment plant would operate at 80 percent capacity in 2006; therefore, cumulative development would not pose a significant effect on the plant.

Burlingame. Demand for community services in Burlingame would increase by approximately 0.6 percent by 1998 and 2 percent by 2010. There would be no station in Burlingame under the proposed project and therefore no cumulative impacts.

Increased demand for community services can be mitigated in a similar manner in each jurisdiction. The ability to meet increased demand will depend on future budgetary processes in each city. Independent of increased budget appropriations, police departments could consider restructuring beats, shifting responsibility for administrative tasks to civilians currently on city staff, and encouraging neighborhood surveillance programs. Similarly, fire departments could consider station relocation to improve service, onsite fire protection devices, and interlocking signal light systems to facilitate emergency response.

Increased water demands may result in a significant cumulative effect, depending on whether SFWD can amend its current entitlement allocations with the cities. In Colma and San Bruno, opportunities to conserve water, increase reliance on available groundwater supplies, or secure other sources would be required to minimize potential cumulative effects on water supply. To counter potential cumulative impacts on the wastewater treatment system, South San Francisco and San Bruno may need to design and implement plant modifications to increase capacity.

Implementation of the mitigation measures recommended above to address cumulative impacts on police, fire, water, and wastewater services would be the responsibility of the affected jurisdictions and users.

Section 6
Geology, Soils, and Seismicity

6.1 Introduction

This section presents a discussion of existing geologic, soils, and seismic conditions. Particular features described include the topography, geology and faults in the project corridor that could potentially pose engineering problems or hazards for BART passengers, facilities and operations. Examples of these hazards include settlement, erosion, landslides, fault rupture, groundshaking and liquefaction, all of which can cause long-term concerns about the structural integrity of BART facilities and interruption of BART service. Impacts directly related to construction activities are addressed later in Section 3.13, Construction.

6.2 Existing Conditions

Topography

The proposed BART extension is located in northern San Mateo County. The northern two-thirds of the project corridor are within the Colma Creek drainage basin, and the southern one-third is within the San Francisco Bay flatlands.

The main geologic features within the Colma Creek basin are the two northwest-southeast trending mountain ranges and the intervening valley floor. San Bruno Mountain to the east rises to more than 1,300 feet above mean sea level (msl). The coastal hills to the west average 300 feet above msl. The central trough of the Colma Creek Valley approaches sea level within the San Francisco flatlands and rises to about 190 feet msl at the drainage divide near the headwater of Colma Creek. The project corridor is near the center line of the valley.

The San Francisco Bay flatlands are characterized by a broad alluvial plain just south of Colma Creek. The alluvial plain is highly urbanized, bounded by shoreline tidal marshland features along San Francisco Bay. The alluvial plain ranges from sea level to less than 100 feet msl. Drainage is controlled by a system of storm drains and lined creek beds.

Shoreline features consist of tidal marshlands that are subject to periodic inundation and exposure during high and low tides. The SFIA is elevated above tidal marshlands by artificial fill. Drainage within the marshland area is usually very poor. The southern half of the project corridor includes alluvial plain, tidal marshlands, and artificial fill areas.

Geology

The Colma Creek drainage basin, including the San Francisco Bay flatlands, is located within a northwest-trending structural trough formed in bedrock of the Franciscan Complex. The trough is approximately two to three miles wide and extends from the Pacific Ocean to San Francisco Bay. The trough follows the northeastern side of the San Andreas Fault. The estimated depth of the trough to bedrock is 2,500 feet, based on aeromagnetic and gravity survey data (Bonilla, 1964).

Sediments of the Merced and Colma Formations were deposited on the Franciscan bedrock within this trough. In the study area, the Merced Formation can be seen in outcrops along the southeast flanks of the coastal hills, extending below the alluvial deposits of Colma Creek to an average depth of 800 feet. The Colma Formation overlies the Merced Formation and is 300 feet thick on average. The Colma Formation can be seen in outcrops along the southwest flanks of San Bruno Mountain and underlies the near surface materials within the alluvial valley of Colma Creek. The Colma Formation extends below the San Francisco Bay flatlands, where it is overlain by recent deposits of San Francisco Bay Mud and artificial fill materials. The study area is further characterized by localized deposits of slope wash and ravine fill materials. The regional geology is shown in Figure 3.6-1.

Geologic Hazards

Settlement. Descriptions of geologic units believed to occur in the project corridor are discussed in the DEIR/Technical Appendix. Of these units, Bay Mud is the most significant in terms of geological hazards. Bay Mud deposits extend from the San Bruno fault, at approximately 2nd Avenue west of Highway 101 to the SFIA and below the San Francisco Bay; these deposits extend as much as 85 feet below artificial fill materials. Bay Mud consists of soft to very soft, highly plastic clay to silty clay, which is compressible when structures are placed on the surface.

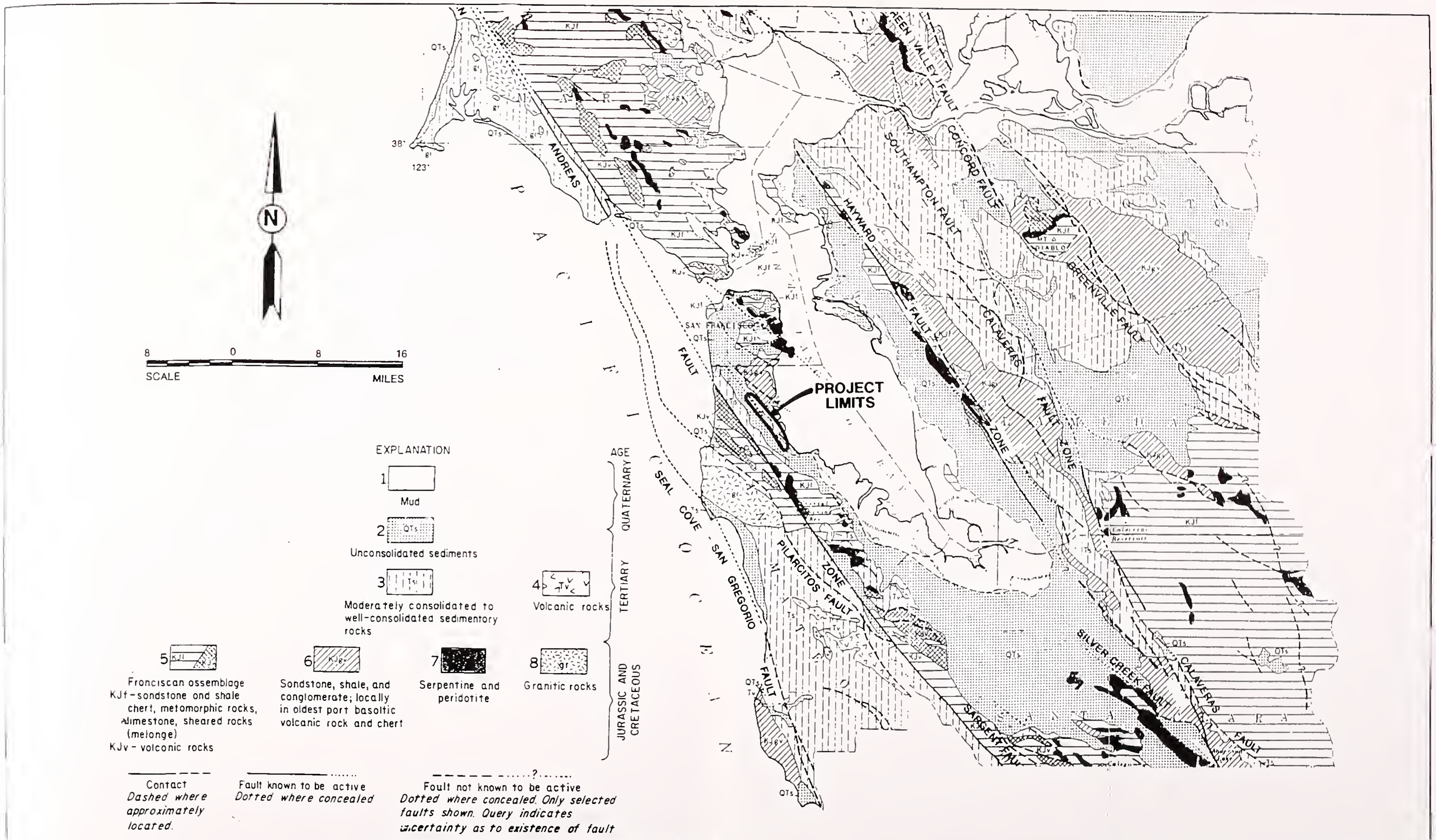
Erosion. The corridor is already largely urbanized, except for Colma Creek and the SFIA property west of Highway 101 (referred to as the west of Bayshore parcel). The potential for long-term erosion from overland drainage into Colma Creek is low because of the moderate slopes (less that 15 percent), landscaped or urbanized drainage areas (the cemeteries), and minimal bare earth. The west of Bayshore parcel includes "Urban Land-Orthents, reclaimed complex" soils that have low runoff characteristics and low potential for erosion hazards. Because of the minimal slopes (0 to 2 percent) and slow runoff characteristics of these soils, erosion hazards are low.

Landslides. No landslides have been mapped within the project corridor, and because of the low relief, landslides would not be expected to occur. Some landslides have occurred on the sides of San Bruno Mountain, but none are close enough to the project corridor to affect the proposed project.

Faults and Seismicity

Fault Rupture. The project corridor is located in a seismically active region which has experienced several strong earthquakes. No known active faults cross the project corridor. Therefore, fault rupture along the alignments is unlikely. Although fault rupture is not expected in the project corridor, significant groundshaking would be experienced during an earthquake.

Groundshaking. The San Andreas Fault, which passes about 1.9 miles west of the project corridor, dominates the tectonics, geology, and physiography of the San Francisco Bay region. Other major active faults which could cause significant shaking in the project corridor are the Hayward, Calaveras, and Seal Cove-San Gregorio faults. The proximity of these active faults to the site and their historic and maximum credible earthquakes (MCEs) are listed in Table 3.6-1 and illustrated in Figures 3.6-2a and 3.6-2b. The MCE for a fault is defined as the largest earthquake that a given fault appears capable of generating, and is related to source geometry, fault behavior, and historical seismicity.



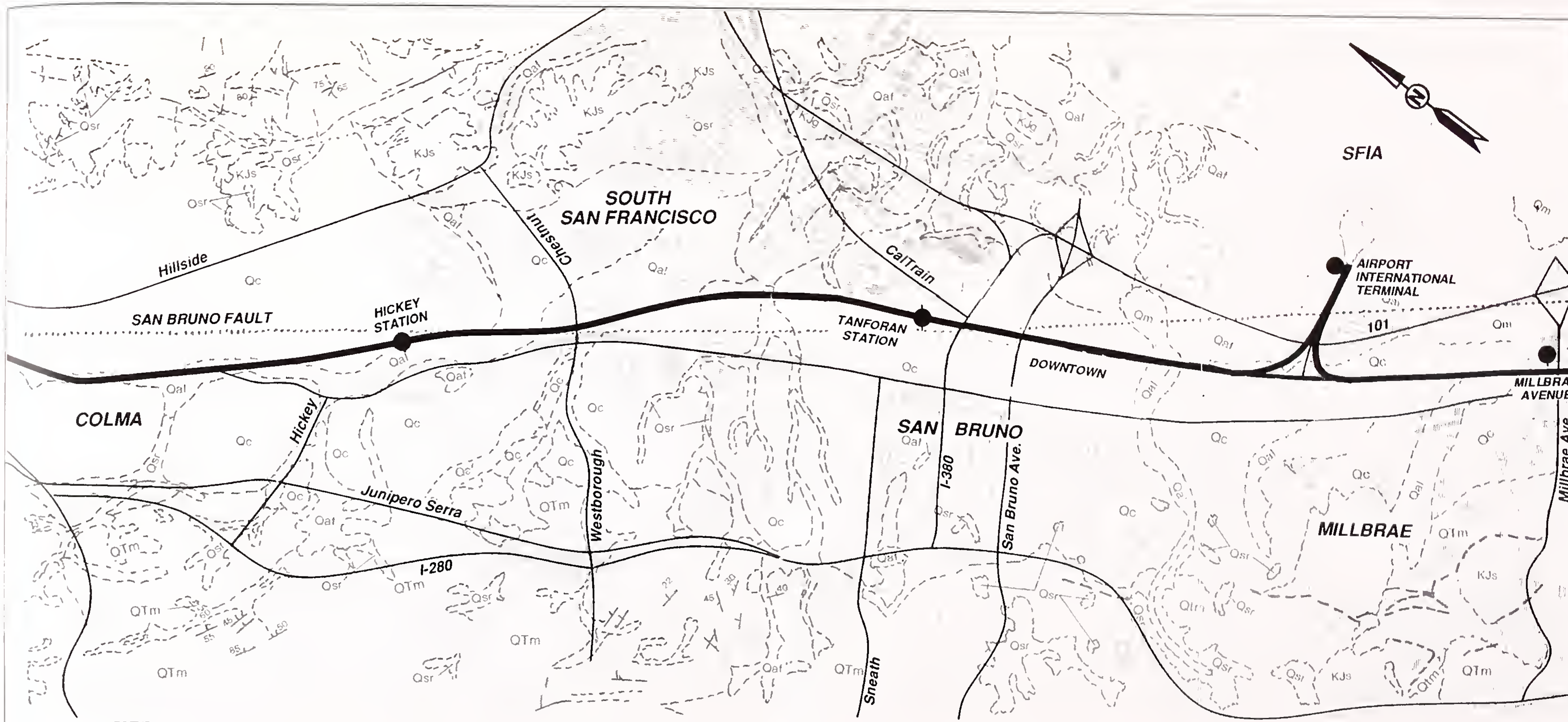
SOURCE: MODIFIED BASE MAP FROM SCHLOKER, 1970

OGDEN

Regional Geology

FIGURE

3.6-1



LEGEND

Qaf	Artificial Fill
Qm	Bay Mud
Qal	Alluvial Deposits
Qsr	Slope Wash and Ravine Fill
Qc	Colma Formation
QTm	Merced Formation
KJs, KJsk, KJc, KJg, KJm, KJi	Franciscan Formation
– – – –	Unit Contact
• • • • •	Hypothetical Fault
50	Strike and Dip of Beds

Proposed Project

BART Station

SOURCE:

1. M.G. BONILLA, 1971, PRELIMINARY GEOLOGY MAP OF THE SAN FRANCISCO SOUTH QUADRANGLE AND PART OF THE HUNTERS POINT QUADRANGLE, CALIFORNIA: U.S.G.S. MISCELLANEOUS FIELD STUDIES MAP MF-311.

2. E.H. PAMEYAN, 1981, "GEOLOGY MAP OF MONTARA MOUNTAIN QUADRANGLE, SAN MATEO COUNTY CALIFORNIA." U.S.G.S. GEOLOGICAL SURVEY OPEN FILE REPORT 81-0451.

SCALE 1:24 000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

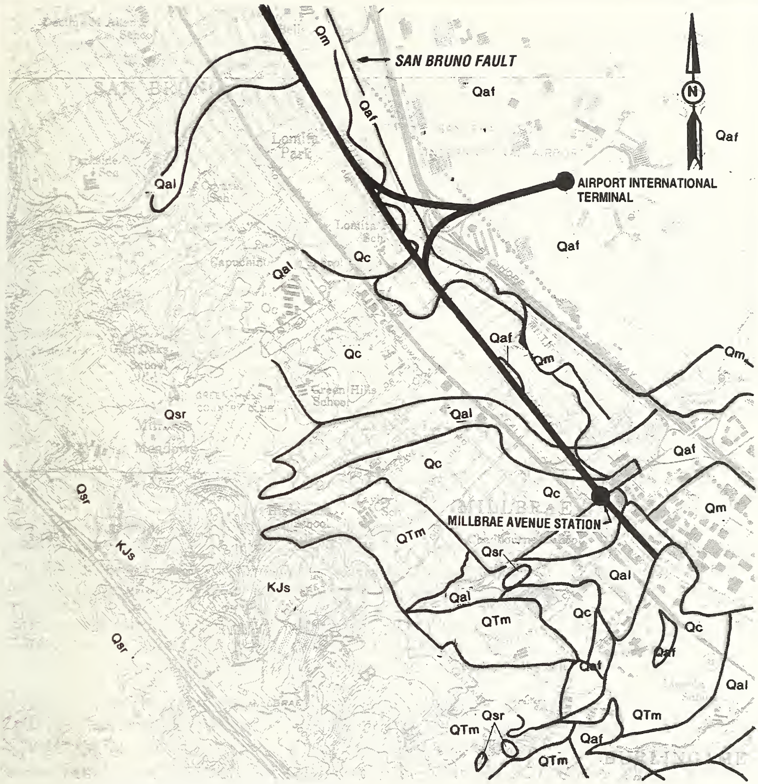
CONTOUR INTERVAL 25 FEET

DATUM IS MEAN SEA LEVEL

OGDEN

Areal Geology

FIGURE 3.6-2a



SOURCE: U.S.G.S. GEOLOGY MAP OF MONTARA, 1981.
U.S.G.S SOUTH QUADRANGLE AND PART OF HUNTERS POINT.

LEGEND

—	Unit Contact
Qaf	Artificial Fill
Qm	Bay Mud
Qal	Alluvial Deposits
Qsr	Slope Wash and Ravine FIll
Qc	Colma Formation
QTm	Merced Formation
KJs	Franciscan Formation

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Areal Geology

FIGURE 3.6-2b

Table 3.6-1
Active Faults Affecting the BART Project Corridor

Fault	Approximate Distance to Project Corridor (miles)	Fault Length (miles)	Maximum[5] Credible Earthquake	Maximum Historic Magnitude
San Andreas	1.9	270[1]	8.0+	8.3[6]
Seal Cove-San Gregorio	8	84[2]	7.5	6.1[6]
Hayward	7	45[3]	7.0	7.0[7]
Calaveras	24	71[4]	7.0	6.6[8]

1) Northern segment
2) Jennings, 1988 – Bolinas to Monterey Bay
3) Ibid., San Pablo to Warm Springs
4) Ibid., Danville to Hollister
5) Kanamori, 1977
6) Richter, 1958
7) Toppozada, 1981
8) Toppozada, 1984

There are other active faults in the region, but these are either farther from the project corridor or are smaller and thus could not cause shaking at the site as strong as that caused by the faults listed in Table 3.6-1. For example, the San Bruno Fault has been mapped as a hypothetical fault by Bonilla (1981). The fault is considered inactive, and the exact location of the fault trace is unknown. The location mapped by Bonilla intercepts the project corridor in three locations, as shown in Figures 3.6-2a and 3.6-2b. Offshore geophysical surveys have detected a zone of faults that are approximately in line with the San Bruno Fault as postulated onshore. This offshore zone has been mapped by McCulloch and Greene (1990). A report by Kennedy *et al.* (1987) states that these features are a potential geologic hazard.

The ground surface acceleration from an earthquake on the San Andreas Fault would be approximately 0.50 g to 0.67 g from a peak bedrock acceleration of 0.68 g.[1] These magnitudes would result in very strong groundshaking.

Liquefaction. Soil liquefaction is a phenomenon in which saturated soils experience sudden and nearly complete loss of strength during seismic events. If not confined, the soil acquires a mobility sufficient to permit both horizontal and vertical movements. Liquefaction can result in shallow foundation failures, boiling, severe abrupt settlements, seismically induced settlement, failure of fill supported on liquefiable soils. The magnitude of liquefaction-induced settlement depends on the thickness and relative density of the liquefiable soils and on the intensity of groundshaking. Soils most susceptible to liquefaction are

1 Measured in units of gravity (g), peak bedrock acceleration is used to estimate the peak ground surface acceleration (bedrock acceleration transferred to the ground surface). The type and thickness of the soil overlying the bedrock determines the relationship between the peak bedrock and peak ground surface acceleration.

loose, uniformly graded, fine-grained sands. Saturated silty and clayey sands may also liquefy during strong groundshaking. However, clayey sands liquefy only if the clay content is quite low.

Based on available geologic data, loose sandy or silty soils comprise a significant portion of the existing artificial fills which overlie Bay Mud in the area of the SFIA. Due to the high groundwater table, the potential for liquefaction of artificial fill is moderate to high. (A discussion of groundwater resources near the project corridor is presented in Section 3.8, Hydrology and Water Quality.) Occasional sand layers known to exist locally in the Bay Mud may also be susceptible to liquefaction.

Elsewhere along the project corridor, the granular soils which comprise the Colma Formation and alluvial deposits within the Colma Creek drainage basin are considered to have a low liquefaction potential. Localized liquefaction is a possibility near the mouth of Colma Creek, where deposition of alluvial sand sometimes causes a maintenance problem, but this area is not located near the BART alignment and would not impact the project.

6.3 Impact Assessment and Mitigation

Significance Criteria and Methodology

In general, the geotechnical characteristics of a site determine the potential for structural and safety hazards that can occur with the site's development. In the case of the project corridor, soil properties, groundwater, fill settlement, and proximity to active earthquake fault zones are the geotechnical factors of principal concern.

The proposed BART extension would result in significant adverse project-specific or cumulative impacts if it would expose people or structures to major geologic hazards, including earthquakes, landslides, mudslides, ground failure, or similar hazards such as settlement and groundshaking. Hydrostatic uplift forces are a potential significant impact on proposed structures that extend below the groundwater level.

Other potential significant impacts, such as alteration of landforms that substantially change the topography or ground surface relief features, and creation of ongoing erosion or unstable geologic conditions that would last beyond the construction period, are not anticipated, except perhaps on a very localized basis (as discussed below). Erosion hazards are not expected because the entire project corridor is relatively level and has no prominent ground surface relief features, and potential erosion areas within Colma Creek are lined. In addition, the only other undeveloped area possibly susceptible to erosion is the SFIA property west of Highway 101. However, in this area, the slope is minimal (0.2 percent) and the soils are "Urban Land-Orthents," which means that they have low runoff characteristics and low potential for erosion hazards. There would be localized erosion impacts where the drainageways are modified, and these impacts are presented in Section 3.8, Hydrology and Water Quality. In addition, there would be significant erosion and sedimentation during the construction period. These effects are addressed in Section 3.13, Construction, of this chapter.

Project-Specific Analysis

1. *The entire project corridor and all proposed transit and roadway facilities would be subject to potentially strong groundshaking due to earthquakes. Adherence to BART design criteria would*

reduce this impact to an insignificant level. However, there still may be significant effects on facilities proposed on the SFIA property east of Highway 101. (S)

Horizontal ground shaking (accelerations) during earthquakes would momentarily increase lateral (sideways) loads on all above- and below-ground structures along the project corridor. These additional loads would cause significant damage or failure of the structures if they are not properly designed to accommodate the earthquake vibrations.

As a result of state mandates following the Loma Prieta earthquake, the *BART Extensions Program Design Criteria,* Volume II, Section 16, were rewritten to substantially increase the required strength of new structures. The design criteria require that all structures built under the BART Extensions Program, including equipment-supporting facilities and equipment, be designed to resist the ground motions caused by the MCE established for the particular project. The MCE ground motion is the maximum level of motion which is expected to occur within the BART service area. The seismic design data developed by BART to represent the MCE are based on a potential earthquake with a maximum horizontal ground acceleration of 0.7 g, caused by rupture of the San Andreas or any of the other historical faults within the BART service area, i.e., the Hayward, Calaveras, Concord, and Antioch faults.

The intent of the criteria is to assure that structures of the BART extensions program are built with sufficient structural flexibility to undergo the effects of the MCE without significant damage. This design policy seeks to avoid the interruption of BART operations due to structure failure or damage during an earthquake. This policy is more conservative than standard design codes, which require that buildings be designed to protect human life during a major earthquake, but not necessarily to maintain the operational viability of the structure. Therefore, the design criteria would reduce the impact of potential strong groundshaking due to earthquakes to an insignificant level. The only exception is for soil conditions found on SFIA property east of Highway 101 where seismic response of BART structures is uncertain.

Evidence presented in a report by Kennedy *et al* (1987) indicates displacement of sedimentary deposits of late Pliocene to Quaternary age located offshore and onshore in the vicinity of Lake Merced. It is not known how far the offshore fault zone extends to the southeast. Small earthquakes that may be on the San Bruno Fault have been recorded near Lake Merced and near the SFIA. In view of these uncertainties, a search for evidence of the San Bruno Fault and recent activity will be performed before and during construction of the project alignment. This search will include various geological and geophysical investigations, including a geological examination of borehole data and a geological examination and mapping of all excavation cuts. If significant faulting is found, portions of the alignment could be adjusted.

MITIGATION MEASURES. Implementation of the following mitigation measure would reduce the impact of groundshaking to the project corridor and all proposed facilities to an insignificant level.

1.1 *Development of Seismic Design for the SFIA.* The BART seismic design data (Section 16.7) have been developed for soil types S_1, S_2, and S_3, as defined in Table No. 23-J of the California Building Code. Soil type S_4, however, may be encountered underneath the SFIA property east of Highway 101, where soft Bay Mud deposits are as much as 85 feet below the artificial fill materials. Design criteria for both soil types S_3 and S_4 have been developed by the Bay Area Transit Consultants (BATC) for BART, using input from the BATC

Earthquake Specialists Board of Consultants. These criteria will be used for structural design on both sides of Highway 101, since BART design criteria are likely more conservative than SFIA design criteria. Site-specific geotechnical studies will be performed on the SFIA property east of Highway 101 in order to develop supplemental seismic design data for structures on these sites. BART will incorporate these data into the design of any facilities in this area.

2. *Horizontal accelerations during seismic events would increase the lateral earth pressures on these below-grade structures. (I)*

   During a seismic event, below-ground walls would be temporarily subjected to additional lateral earth pressure which would depend on the magnitude of the ground acceleration and the height of the wall. These temporary seismic earth pressures would occur in addition to the existing static earth pressures and would represent an additional force that the structures must bear. Potential impacts include cracking or failure to below-grade structures from the Colma Station tailtracks to South Spruce Avenue, from San Bruno Avenue to approximately Cupid Row west of Highway 101, and at the Hickey and Airport International Terminal Stations.

   Existing BART design criteria require below-grade, reinforced box structures to be designed to withstand lateral pressures due to horizontal accelerations during seismic events. Section 16.8.4 of the BART design criteria contains procedures for designing underground structures for seismic loads. These procedures state that for underground structures with a maximum depth of 30 feet or less, outside walls should be designed for additional earth pressure based on the Mononobe-Okabe method (shown in Appendix B of the criteria), a simplified, general method. This design method would assure that the wall is adequately designed for a combination of static and seismic loading. BART will incorporate these criteria into contractor plans and specifications for construction of the alignment. Therefore, this impact is insignificant and BART below-grade structures would not be adversely affected.

   For underground structures exceeding 30 feet, potential seismic forces on the structures are greater and more critical; Section 16.8.4 states that a site-specific geotechnical criteria report should be prepared stipulating seismic design criteria for the proposed below-ground facilities. However, at present no below-ground walls are expected to exceed 30 feet below ground.

3. *Retained cut walls along the track segment just south of Cupid Row would experience momentary increases in lateral earth pressures due to horizontal accelerations from earthquakes. (I)*

   Temporary additional seismic earth pressures would occur on retained cut walls during earthquakes. Seismically induced earth pressures during earthquakes could result in lateral movement of the walls, causing cracking or failure.

   Existing BART design criteria require retained cut walls to be designed to withstand lateral pressures due to horizontal accelerations from earthquakes. Seismic design procedures for earth-retaining structures are outlined in Section 16.8.2 of the seismic design criteria. In accordance with these criteria, the total lateral soil pressure for walls subject to seismic loading is determined by adding a seismic pressure component to the static pressure component. The design criteria (Sections 16.8.2.2 and 16.8.2.3) outline procedures for calculating seismic loading on yielding walls and rigid walls, and require that facilities be designed accordingly. For example, the stability of the retained cut wall and the overall stability of the structure under maximum seismic loads

(MCE) is checked using a minimum load factor of safety of 1.1. In other words, the structure's ability to withstand the MCE-force earthquake is calculated by combining all the forces acting on the structure and designing its strength to withstand at least this amount of load, expressed as 1.1. This assures the structure is adequately designed for a combination of static and seismic loading. BART will incorporate these design criteria into contractor plans and specifications for construction of the alignment. Therefore, this impact is insignificant and BART structures would not be adversely affected.

4. *Proposed cut-and-cover subway sections of the alignment and subway stations would be subjected to hydrostatic uplift forces, since these structures would likely extend below the groundwater level. (I)*

Wherever proposed below-ground structures extend below the groundwater level, the groundwater exerts an upward force on the structure. This upward pressure, termed hydrostatic uplift, could lead to cracking, strains, and distress in the overlying BART track sections or slab foundations.

A shallow water table is known to exist at a depth of about 20 feet below the ground surface in the Colma area. Therefore, the cut-and-cover subway sections of the alignment from Colma to the Tanforan Station, and from the Tanforan Station to approximately Cupid Row, and at the Hickey Station are likely to extend below the groundwater level, and thereby be subjected to hydrostatic uplift forces.

Existing BART design criteria require cut-and-cover subway sections and subway stations to be designed to withstand hydrostatic uplift forces. Section 9.3.6 of the design criteria requires that underground structures be designed with a minimum factor of safety against flotation. This required minimum is 1.03 at any construction stage and 1.07 when the structure is complete (excluding any benefit from skin friction). Additionally, the design criteria stipulate the use of deep foundation elements, such as pile foundations, where hydrostatic uplift forces exceed the weight of the structure. BART will incorporate these design criteria into contractor plans and specifications for construction of the Aerial Design Option LPA. Therefore, this effect is insignificant and BART structures would not be adversely affected.

5. *Settlement of the Hickey and Tanforan Stations is projected to be minimal because the underlying soils are not weak and are relatively compressible and because the subway box would essentially function as the station foundation. It may, however, be necessary to support the garages at these stations on piles. (I)*

The station structures would apply downward pressure on the supporting foundations. The compression of the underlying soils would result in an overall settlement of the structures. In addition, settlement would not occur uniformly, as some soils are weaker or more compressible than others. Total and differential settlement, however, would not be significant for the soil types in these segments of the corridor.

Existing BART design criteria require that the Hickey and Tanforan Stations and associated parking structures be designed to withstand settlement impacts due to the compression of underlying soils. Section 6.2 of the design criteria gives applications and design procedures for shallow foundations. This section states that shallow foundations may be used where there is a suitable bearing stratum near the surface, if there are no highly compressible layers below, and if the calculated settlements are acceptable. In order to prevent unequal settlement, footings should be designed to keep the

pressure under long-term sustained loads as nearly uniform as practicable. BART will incorporate these design criteria into contractor plans and specifications for construction of the Aerial Design Option LPA. Therefore, this impact is insignificant and BART structures would not be adversely affected.

6. *Settlement of footings supporting the at-grade Millbrae Avenue Station could be large, due to consolidation of the near-surface artificial fills and underlying soft, compressible, clayey soils which exist in the area of the SFIA. (I)*

   Footings used to support the Millbrae Avenue Station facilities may be underlain by soft, compressible, clayey soils believed to exist in this area. The weight of the station facilities on the footings would be relatively large; the degree of settlement would be a function of the weight of the facilities, the thickness of the artificial fill, and the thickness of the underlying Bay Mud. The majority of the settlement would be time-dependent, due to consolidation of the underlying Bay Mud. The long-term settlement of shallow spread footings underlain by these soft, compressible, clayey soils could be as much as 2 to 3 inches, and differential settlements between adjacent footings could be as much as 1 inch. If not properly mitigated, the magnitude of these settlements would likely result in significant strains on the station and parking structure which could cause structural damage or failure.

   Existing BART design criteria require the at-grade Millbrae Avenue Station to withstand settlement of footings due to consolidation of near-surface artificial fill and underlying soft, compressible, clayey soils. Section 6.2 of the design criteria states that where the bearing stratum at ground surface is underlain by weak and compressible materials, the use of pile foundations should be considered. By supporting the structure on piles, which extend through the clay layer, the impact of settlement due to consolidation of the soft soils would be reduced. Section 6.3 of the design criteria provides design procedures for pile foundations. The design criteria include provisions for uplift, downward, and lateral loads on piles, and adopt strict installation criteria to limit ground consolidation, building settlement, and disturbance to local residents from the vibratory effects of pile driving. BART will incorporate these design criteria into contractor plans and specifications for construction of the Aerial Design Option LPA. Therefore, this impact is insignificant and BART structures would not be adversely affected.

7. *Corrosive subsurface soils, if they exist in the area of proposed underground structures along the project corridor, would have a detrimental effect on concrete, reinforcing steel, and metals exposed to these soils. (I)*

   Depending on the degree of corrosivity of subsurface soils, concrete and reinforcing steel in concrete structures and bare metal structures exposed to these soils could deteriorate, which could eventually lead to structural failures.

   Existing BART design criteria require that concrete, reinforcing steel and metals used in construction of BART facilities be designed to withstand corrosive subsurface soils. Section 6.1.5 of the design criteria states that foundation design should take into account the presence of potentially detrimental substances in soils, if any, such as chlorides and sulfates. This may be accomplished by providing appropriate protection for reinforcement, concrete, and metal embedments. BART will incorporate these design criteria into contractor plans and specifications

for construction of the Aerial Design Option LPA. Therefore, this impact is insignificant and BART structures would not be adversely affected.

Aerial Wye-Stub to the SFIA

8. *The aerial wye-stub and Airport International Terminal Station would be subject to strong groundshaking due to locally active faults. (S)*

   MITIGATION MEASURE. Implementation of Mitigation Measure 1.1, i.e., development of seismic design data for SFIA, described above, would reduce the impact of groundshaking for aerial facilities to an insignificant level.

9. *Settlement of driven piles under the proposed aerial guideway section between the CalTrain/BART mainline, Highway 101, and the Airport International Terminal Station would occur because of the soft, compressible, clayey soils underlying the area. (I)*

   Consolidation of compressible soils under the applied loading of the aerial guideways and Airport International Terminal Station could result in settlement of piles and differential settlement between adjacent piles, if the piles were not driven through this soft clay layer. If the pile-supported structure were not properly designed to tolerate these settlements, significant strains would occur on the aerial structures which could lead to cracking.

   Existing BART design criteria require that piles used to support the proposed aerial guideway section and facilities be designed to withstand impacts associated with settlement due to soft compressible, clayey soils underlying the project alignment. Section 8.3 of the design criteria states that differential settlement must be considered, especially where underlying soils create concerns. These design criteria also specify a maximum allowable settlement between adjacent piers supporting an aerial structure. BART will incorporate these design criteria into contractor plans and specifications for construction of the Aerial Design Option LPA. Therefore, this impact is insignificant and BART structures would not be adversely affected.

10. *The aerial wye-stub across the SFIA property west of Highway 101, the Airport International Terminal Station, and the at-grade Millbrae Avenue Station may be susceptible to localized liquefaction. (I)*

    Artificial fill materials, which are known to be approximately 10 to 15 feet thick in the vicinity of the SFIA, may liquefy during earthquakes and lose their ability to support structures. Localized liquefaction could result in seismically induced settlements of shallow foundations and create potential downdrag (downward) forces on deep foundations. The magnitude of seismically induced settlement would depend on the thickness and relative density of the liquefiable soils. If not mitigated, these settlements could result in shallow foundation failures and significant damage to underground utilities.

    Existing BART design criteria require that the project facilities be designed to withstand liquefaction. Section 16.6 of the design criteria states that a geotechnical report must be prepared as part of the seismic design for a structure that will be underlain by potentially liquefiable soils. The geotechnical report will address the potential liquefaction effect of deep box structures on adjacent light structures with shallow foundations. If the report concludes that liquifaction may be of concern, then Section 6.3 of the design criteria applies. This section specifies that pile

foundations should be used where there is a potential for seismically induced settlement, and that the design of piles should take into consideration the effect of negative skin friction which may result from the settlement of fill materials. By supporting the structure on piles that extend through the potentially liquefiable artificial fills and underlying soft Bay Mud, the impact of seismically induced settlement is insignificant. BART will incorporate these design criteria into contractor plans and specifications for construction of the Aerial Design Option LPA.

Cumulative Analysis

The cumulative impact study area consists of the northern half of San Mateo County, from the Town of Colma to Burlingame. In addition to the BART extension, other major pending projects within the study area are described in SFIA Master Plan and the *El Camino Corridor Redevelopment Plan.*

Due to the low relief of the Colma Creek drainage basin and San Francisco Bay flatlands which make up the study area, the proposed project in conjunction with other pending developments recommended by these plans is not expected to have long-term slope stability or erosion impacts in the project corridor.

While there would be no cumulative effects as a result of specific, known development projects, the proposed project's effects may cumulate with growth expected to occur in accordance with local and regional general plans and as forecast in ABAG's *Projections '94*. Increased development at the SFIA and in the project corridor would increase the population subject to seismic hazards and the Aerial Design Option LPA would contribute incrementally to these hazards. Since the cumulative projects will be designed and constructed in accordance with local building codes, including the Uniform Building Code (which has been incorporated by many jurisdictions into local building codes), additional mitigation measures would not be required for this significant cumulative impact. In addition, geotechnical reports will be prepared for each individual project to identify potential geotechnical hazards and to recommend engineering solutions to reduce these hazards to an insignificant level. Geotechnical reports will include recommendations for the proper placement and compaction of fills, excavations, the construction of temporary and permanent slopes, mitigation of liquefaction potential, mitigation of seismic hazards, groundwater control, proper drainage, erosion control, and mitigation of settlement. Individual project applicants would need to demonstrate conformance with these reports.

Section 7
Biological Resources

7.1 Introduction

This chapter presents the results of the biological surveys and data searches conducted for the project corridor. The principal intent of this section is to document the presence or potential presence of significant biological resources within the project corridor that may be affected by the proposed BART–San Francisco Airport Extension, the expected impacts, and proposed mitigation measures. Specific scientific nomenclature used throughout this section conforms to Munz (1959) for plants, Peterson (1969) for birds, Stebbins (1985) for reptiles and amphibians, and Jameson and Peeters (1988) for mammals. The impacts addressed in this section are those associated with operation of the Aerial Design Option LPA. Impacts directly related to construction activities are addressed later in Section 3.13, Construction.

7.2 Existing Conditions

Vegetation Communities and Wildlife Habitats

The dominant vegetation communities along most of the project corridor between Colma and San Bruno are ruderal (weedy) and landscaped non-native vegetation. The largest extent of native vegetation types is located on the SFIA property west of Highway 101 (referred to as the west of Bayshore parcel). All vegetation communities on the west of Bayshore parcel are delineated in Figure 3.7-1. Vegetation communities and wildlife habitats occurring within the project corridor are discussed below. Lists of wildlife and plant species identified during field surveys are presented in the DEIR/Technical Appendix.

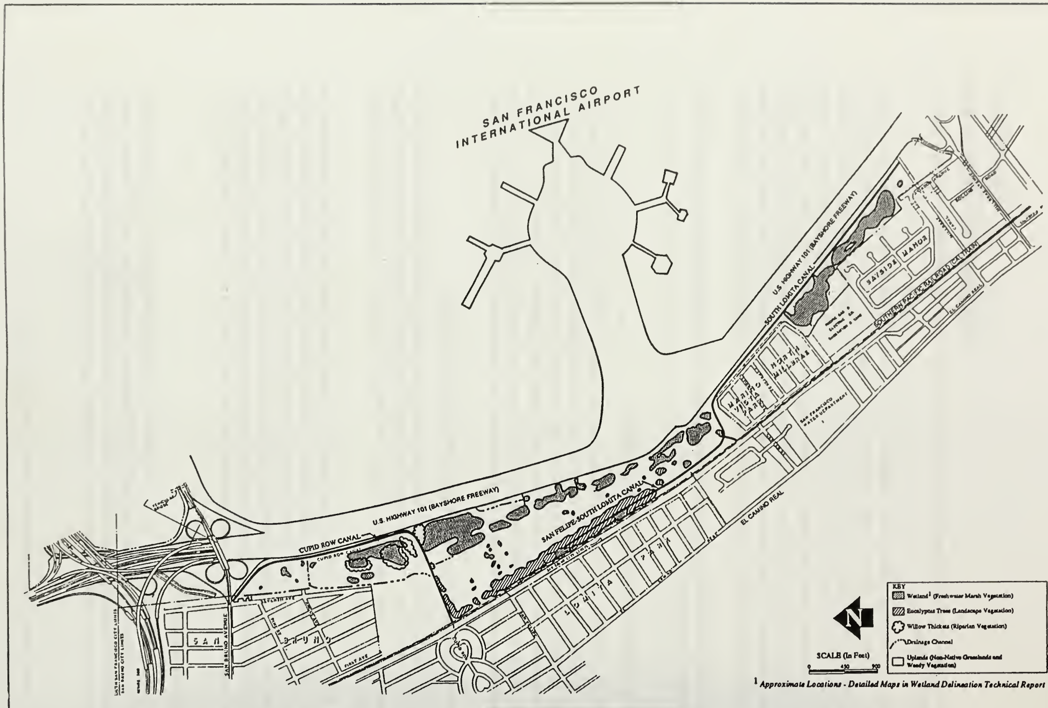
Freshwater Marsh and Seasonal Wetland Vegetation (Wetland)

Freshwater marsh vegetation is found scattered along creek channels and in depressions that fill with water for most of the year. This vegetation community is typically dominated by freshwater emergent plants such as tulles, rushes, grasses, and sedges. Freshwater marsh supports a wide variety of terrestrial and aquatic wildlife species.

Seasonal wetland vegetation in the project corridor is typically associated with shallow depressions and drainage swales or intermittent flowing creeks. Seasonal wetlands are typically dominated by annual herbaceous (non-woody) plants, and although they accommodate a smaller number of wildlife species, they can support a more unique assemblage of wildlife and plant species. These plant communities occur in scattered locations along the project corridor, but are most prevalent on the west of Bayshore parcel. For a more detailed description of these wetland types, see the discussion on "Sensitive Habitats" below.

Non-Native Grassland (Upland)

Non-native grassland vegetation is one of the dominant vegetation communities in the project corridor. The largest extent of this vegetation type and wildlife habitat is located on the west of Bayshore parcel, where it presently comprises approximately 30 acres. It also occurs in scattered locations along other portions of the project corridor, where urban disturbances have been limited to mowing or fires and have



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Vegetation Communities and Wildlife Habitats of SFIA Property
West of Highway 101

FIGURE 3.7-1

not involved the disturbance of soils. The dominant plants in this community are non-native annual grasses, and non-native and native forbs (wildflowers). These grasslands provide good habitat for small mammals and their predators, such as gopher snakes, red-tailed hawks, and other raptors. Small birds also forage in these fields.

Riparian Vegetation (Willow Thickets)

There are no extensive riparian corridors, with the vertical tiers of vegetation typically associated with undisturbed creeks, within the project corridor. Rather, the riparian vegetation in the project corridor occurs as scattered arroyo willow thickets along Colma Creek and along Cupid Row and South Lomita Canals on the west of Bayshore parcel. Although this limited development of riparian vegetation reduces the wildlife values of these habitats in comparison to more well-developed riparian corridors, they still represent valuable nesting and cover habitat for a wide variety of wildlife species.

Ruderal (Weedy) Vegetation

Disturbed habitats in this area are typically dominated by invasive, annual and perennial, non-native, weedy plant species such as anise and thistles. Historically, this region was dominated by coastal scrub habitat and a remnant native woody plant of this native habitat that typically occurs in the area is the coyote bush. Wildlife species typically associated with this habitat type are similar to those of the non-native grasslands. Ruderal habitat is typically associated with vacant lots, roadsides, construction staging areas, and other types of disturbances which alter the surface soils. This vegetation type is common within urban settings similar to that of the project corridor, and frequently occurs within the SPTCo railroad right-of-way.

Landscaped Vegetation

Landscaped vegetation, sometimes referred to as urban mix vegetation, is composed of trees, shrubs, and ground cover that have been planted for landscape purposes and have become naturalized, such as blue gum (*Eucalyptus globulus*) and acacia (*Acacia* spp.). The largest landscaped areas occur in Colma cemeteries and in the blue gum groves on the west of Bayshore parcel, although large landscape trees are scattered along much of the urbanized project corridor. Although the groves of trees and artificial ponds provide some nesting and foraging habitat for birds, the park-like lawns and manicured flower beds limit the amount of cover and thus the value of these habitats.

Sensitive Plant Species

Sensitive plants identified in this FEIR/FEIS include those listed by the U.S. Fish and Wildlife Service (USFWS) (1993a) under the Federal Endangered Species Act (FESA); California Department of Fish and Game (CDFG) (1988 and 1993) under the state Native Plant Protection Act (NPPA) and state Endangered Species Act (ESA); and the California Native Plant Society (CNPS) (Skinner and Pavlik, 1994). The CNPS listing is sanctioned by the CDFG and serves essentially as its list of "candidate" plant species for future listing under the state NPPA and state ESA.

Twenty-four sensitive plant species are known to occur in the northern San Francisco Peninsula or project region. Lists of all sensitive plant species known to occur in the northern San Francisco Peninsula are presented in the DEIR/Technical Appendix. Eight of these 24 are known to occur in habitats similar to

those found in the project corridor. These eight species include the San Francisco gumplant, Diablo helianthella, San Francisco campion, San Francisco's owl's-clover, San Francisco lessengia, Fragrant fritillary, Kellogg's horkelia, and San Mateo tree lupine. None of these species or any other sensitive plant species were found in the project corridor during the field surveys performed for the AA/DEIS/DEIR (in December 1990, and January–May 1992) or for the DEIR/SDEIS (June 1993–May 1994).

Sensitive Animal Species

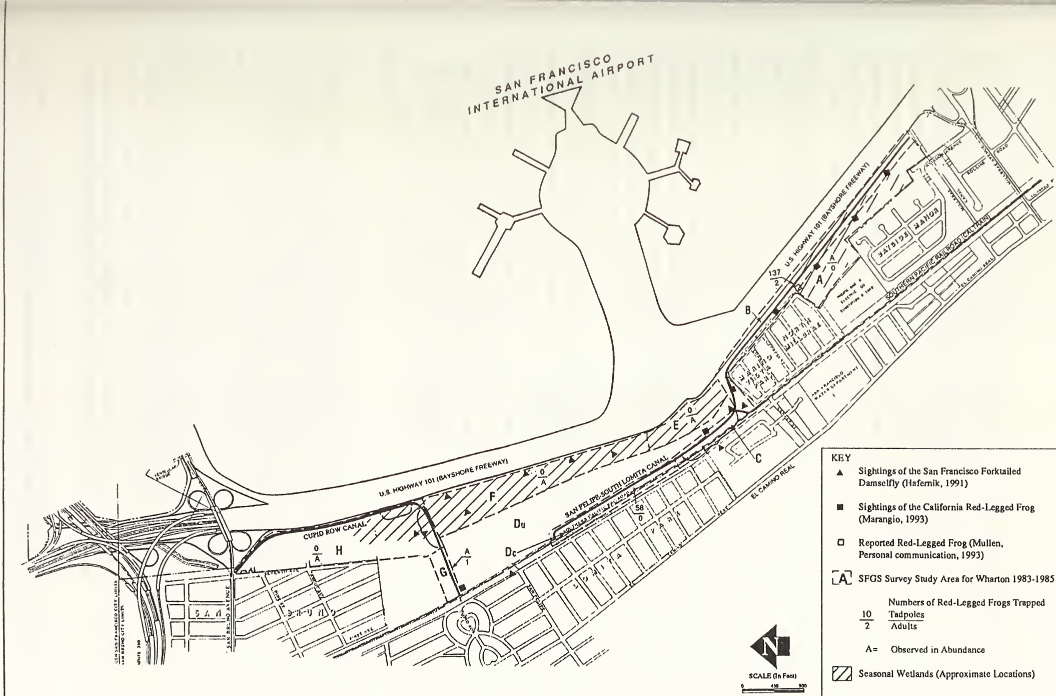
Sensitive animal species identified in this FEIR/FEIS include those listed by the USFWS (1989), CDFG (1988, 1990b, 1991), as well as species of special concern to the scientific community due to their limited range, restricted distribution, or small population size, as defined by Remsen (1978), Williams (1986), and Tate (1986). The USFWS and CDFG maintain periodically updated lists of wildlife species determined by the respective agency to be endangered or threatened, and unofficially recognize additional species as candidates for listing. Candidate species may become eligible for listing upon further research by the USFWS or the CDFG. A list of sensitive wildlife species known to occur in the project region is provided in the DEIR/Technical Appendix. A brief discussion of these species is presented below.

San Francisco Garter Snake

The San Francisco Garter Snake (SFGS) (*Thamnophis sirtalis tetrataenia*) is listed as endangered under the FESA (Federal Register, 1967) and is also state-listed as endangered (CDFG, 1989). In the project corridor, the SFGS inhabits the west of Bayshore parcel and has been found in five general areas (Wharton, 1988; McGinnis, 1992): the area south of San Bruno Avenue and north of Cupid Row Canal (Area H), Cupid Row Canal itself (Area G), the area along and including the San Felipe–South Lomita Canal (Areas Dc and C), the seasonal wetlands immediately west of Highway 101 (Areas E and F), and the uplands between San Felipe–South Lomita Canal and the seasonal wetlands (Area Du). Each of these areas has been given a letter designation in previous studies on this property (Wharton, 1988; McGinnis and Larsen, 1991) and are so designated here (Figure 3.7-2). The largest numbers of SFGS individuals are found in South Lomita Canal (Area C), where aquatic habitats are available year-round. In the spring months, the seasonal wetlands immediately west of Highway 101 (Areas E and F) are typically full of water and attract the SFGS to these habitats to feed. The San Felipe portion of the San Felipe–South Lomita Canal (Area Dc) is used in the spring when it is full of water and as a travel corridor between Cupid Row Canal and South Lomita Canal. Cupid Row Canal at one time had good habitat quality for the SFGS, but has been altered by tidal influences and is now of poor habitat quality. Trappings in Areas H and Du have resulted in few SFGS, indicating limited use of these areas.

California Red-Legged Frog

The California red-legged frog (*Rana aurora draytonii*) has been listed as threatened under the FESA (Federal Register, May 23, 1996) and is a California "Species of Special Concern." A survey of the west of Bayshore parcel for the red-legged frog in September and October 1993 indicated that Cupid Row Canal provides habitat only at the west end, where water is fresh enough for survival, and that South Lomita Canal appears to provide good-quality habitat and breeding grounds for adult red-legged frogs as well as the non-native bullfrog *(Rana catesbeiana).*



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Reported Locations of the SFGS, San Francisco Forktail Damselfly, and California Red-Legged Frog in SFIA Property West of Highway 101

FIGURE 3.7-2

San Francisco Forktail Damselfly

The San Francisco forktail damselfly (*Ischnura gemina*) is a candidate for listing as endangered or threatened under the FESA. This species is associated with seepages, ponds, and slow-moving streams or canals. A survey, conducted in September and October 1993 on the west of Bayshore parcel between the North Millbrae community and the Millbrae Canal to the south (Figure 3.7-2), concluded that current conditions do not appear adequate to support a breeding population (Hafernik, 1993b). This survey reconfirmed an earlier survey (Hafernik, 1993a) indicating that active, adult breeding populations of the San Francisco forktail damselfly still exist in the seasonal wetlands just west of Highway 101 and in northern portions of the South Lomita Canal. The best breeding habitat for this insect is in the large seasonal wetland at the northeast end of Area F, because this wetland remains the wettest for the longest time.

Sensitive Habitats

Sensitive habitats and plant communities are those which are considered rare in the region, support sensitive plant or animal species, and/or receive regulatory protection (e.g., wetlands under the Section 404 permit process and/or the CDFG Streambed Alteration Agreement). Sensitive habitats occurring within the project corridor include three types of wetland habitats: the concrete-lined creek channel of Colma Creek, seasonal wetlands and intermittently flowing creek channels, and stormwater drainage canals with perennial water and emergent freshwater marsh vegetation. In San Mateo County, as well as in all counties surrounding the San Francisco Bay, development has resulted in the gradual reduction of a significant amount of coastal marsh habitat and the plant and animal species it supports. Since 1850, the bay and delta region has lost 89 percent of all tidal and non-tidal wetlands. It is assumed this trend will slow considerably, given current laws and regulations protecting wetlands. Nevertheless, some amount of wetland habitat, ranging from low to high quality, will be lost to future cumulative development (as forecast by ABAG and controlled by local general plans). A wetland delineation has been performed for this FEIR/FEIS as part of the permit process under Section 404 of the Clean Water Act and has been verified by the Army Corps of Engineers (ACOE). A copy of the Wetland Delineation Technical Report is available for review at the BART offices, 1000 Broadway, Oakland, California.

Colma Creek

The concrete-lined channel of those wetland habitats associated with Colma Creek are of limited wildlife habitat value. Although scattered willow trees have become established along this creek in cracks in the concrete and along the upper banks above the concrete, there is no continuous riparian vegetation strip, and thus habitat value for aquatic organisms and other wildlife species is limited. Colma Creek's principal function is as a stormwater channel to reduce flood hazards within the watershed.

Seasonal Wetlands and Drainages

The largest extent of wetland habitat in the project corridor occurs within the west of Bayshore parcel and consists of seasonal wetlands and drainage channels and canals filled with typical freshwater marsh vegetation. These seasonal wetlands are inundated in the winter, spring, and early summer months in normal rainfall years and are completely dry in the summer and fall months. The seasonal wetlands range from shallow depressions that support freshwater marsh vegetation during the wet seasons and upland

annual plant species during the dry seasons, to deeper and larger depressions that support marsh vegetation and willow thickets year-round. The intermittent creeks and channels also vary in structure, from willow thickets on an intermittent creek at the Hickey Station site to earthen ditches with little more than annual ground cover on the upper banks on the west of Bayshore parcel.

The seasonal wetlands on the west of Bayshore parcel are of high habitat value because they provide feeding areas for the endangered SFGS. The intermittent drainage channels at this site provide limited wildlife habitat values because of a lack of cover and dependable source of surface water. These wetlands function as floodplains and stormwater drainages.

Drainages with Perennial Water

Although the larger stormwater drainage canals on the west of Bayshore parcel (South Lomita and Cupid Row Canals) provide year-round water, the habitat values vary. The South Lomita Canal has high habitat value because it supports the endangered SFGS as well as a number of other species. Nearly all of Cupid Row Canal on the west of Bayshore parcel is open to tidal influence. The habitat value of this canal is not as high as that of South Lomita Canal because it does not support the endangered SFGS, but is still considered high because it supports the San Francisco forktail damselfly and the red-legged frog. Each of these larger canals function as stormwater drainage channels, and the South Lomita Canal also functions as a flood storage canal.

Regulatory Setting

Because of the resources and habitats within the project corridor, project implementation will require federal and state permits or agreements related to the presence of biological resources. The principal actions that would need to be pursued are:

- ACOE-administered Clean Water Act, Individual 404 or Nationwide 26 permit;
- CDFG Streambed Alteration Agreement; and
- FESA, Section 7, Consultation, and Section 9, Permit.

Waters of the U.S. and Wetlands

Pursuant to the Clean Water Act, projects that involve potential dredging or filling impacts to "waters of the U.S.," including wetlands, must be reviewed by the ACOE and the U.S. Environmental Protection Agency (EPA). Under certain conditions, aggregate wetland impacts (defined as direct fill or indirect effects of fill) of less than 1 acre may not require an Individual 404 permit. Certain activities in waters or wetlands are automatically authorized, or granted a general permit, which allows the filling of wetlands where impacts do not exceed 1 acre. The ACOE has discretionary jurisdiction over proposed impacts affecting between 1 and 10 acres (i.e., the ACOE can issue either a General[1] or an Individual[1] permit), and mandatory jurisdiction over impacts of 10 acres or more (i.e., an Individual permit would be required). BART has completed and submitted a Section 404 permit application to the ACOE. BART included a proposed wetland mitigation plan in the application package. The mitigation plan and Public Notice, issued by the ACOE, on the BART application are included in Volume V of this FEIR/FEIS.

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[1] Individual permit = authorization issued following a case-by-case evaluation.
General permit = authorization issued on a nationwide or regional basis.

Streams

The CDFG has authority to reach an agreement with a developer proposing to affect intermittent or permanent streams, pursuant to Section 1603 of the State Fish and Game Code. The CDFG generally evaluates the information gathered during preparation of an EIR and attempts to satisfy its permit concerns in this document. In accordance with its policy of "no net loss" of wetland habitat, the CDFG encourages completion of a mitigation program to offset impacts to wetlands and riparian habitat, regardless of the amount of acreage affected.

Endangered Species

The only plant or wildlife species listed under the FESA found in the project corridor are the SFGS and red-legged frog. The SFGS is a federally listed endangered species, and the red-legged frog is a federally listed threatened species. Any activity that disturbs these animals or their habitats could result in a violation of Section 9 of the FESA, which prohibits an unauthorized "take" of federally listed species. The USFWS has the authority to allow a "take" of SFGS and red-legged frog habitat pursuant to a FESA Section 7 formal consultation. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such activities. A "take" may include significant habitat modification or degradation that actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or shelter. The resultant Biological Opinion (BO) from the USFWS may authorize a limited level of incidental take for federally listed species. Potential impacts to those habitats occupied by SFGS and/or red-legged frog would require consultations with the USFWS under Section 7 of the FESA before any alterations or developments on the site would be permitted.

BART completed and submitted a Biological Assessment (BA) to the USFWS in January 1996. The BA describes the proposed action, its expected impacts to the listed species, and the proposed mitigation measures designed to avoid, reduce, and/or compensate for the identified impacts to avoid jeopardizing the continued existence of the listed species on the project site. The USFWS requested and was provided additional information, in written form as well as in meetings. Based upon the information provided in the BA and supplemental materials, the USFWS issued a BO on May 20, 1996. The BO also listed a number of reasonable and prudent measures designed to further minimize impacts to the SFGS and red-legged frog in order for the project to be exempt from the prohibitions of Section 9. For a detailed description of the impacts, mitigation measures, and "take" terms and conditions, the reader should refer to the BA and BO in Volume V of this FEIR/FEIS. A summary of the impacts and proposed mitigation measures is provided in this section and later in Section 3.13, Construction/Biological Resources.

The SFGS is also a state-listed endangered species. All state agencies consider the need to protect and conserve the SFGS when reviewing projects proposed within known or suspected habitats of the listed species. A 2081 permit and/or memorandum of understanding from the CDFG would be required before the state would allow a "take" of SFGS. The state definition of "take" is "to hunt, pursue, capture or kill or attempt the same."

Significance Criteria and Methodology

Significance Criteria. The significance criteria established for the proposed BART–San Francisco Airport Extension are based upon CEQA and NEPA guidelines, the issues and concerns expressed in the comments on the AA/DEIR/DEIS document and scoping report, and on the experience of the EIR preparers with projects in the region concerned with similar biological resources. For the purposes of this document, significant impacts include the following:

- Any impact to state or federally listed endangered, threatened, or rare species, their habitats (such as breeding areas, travel or migration routes, and buffer areas), and/or plant or animal taxa that are otherwise protected under federal or state statutes;
- Any impact to a high-quality or undisturbed biological community, vegetation community, or wildlife habitat that is restricted in extent in the State of California or in the San Francisco Bay region, such as wetlands; and
- Any impact to biological resources recognized by the scientific community as having important scientific interest because of unusual variation or physical or geographical limits.

Adverse but insignificant impacts include disturbances to common, native biological habitats or vegetation communities that if lost would not represent a significant threat to the preservation of regional diversity and productivity; impacts to non-native vegetation communities (such as eucalyptus groves) that do not support other important native species; or the loss of biological habitats that have already been significantly disturbed and thus represent a more common habitat type in this urbanized setting.

Methodology. Methods used to analyze impacts included:

- review of 1993 aerial photographs (1"= 200') overlaid on the conceptual plans and profiles to identify and calculate areas of impact;
- interviews with noted experts on specific sensitive species to gain knowledge on the behavioral patterns of these species and their likely response to the proposed facilities; and
- reviews of the impact analysis for other resources, such as hydrology and water quality, to better assess potential effects to biotic resources.

The impacts are based on the conceptual plans and profiles and are subject to refinement as the project engineers undertake final design. In the case of impacts to "waters of the U.S.", including wetlands, the impact analysis was based upon engineering plans developed for the Section 404 permit application submitted to the ACOE (February 1996). In the case of impacts to endangered, threatened or other sensitive wildlife species, the impact analysis was based upon consultation and correspondence with the USFWS under Section 7 of the FESA.

Since wetlands were evaluated for impacts under Section 404 of the Clean Water Act as well as Section 7 of the FESA, impacted wetlands on the west of Bayshore parcel are included twice in the impact analysis—once for impacts only to the jurisdictional "waters of the U.S." and once for impacts to habitat of the SFGS, red-legged frog, and San Francisco forktail damselfly. Separate mitigation measures are proposed for each of these types of impacts.

This section addresses the permanent loss of significant biotic resources and habitats that can be attributed to displacement by project features. For example, existing biotic resources would be lost or displaced

within the areas where project facilities would occur at grade, in retained cut, or in an aerial alignment. Section 3.13 addresses impacts due to construction activities.

The state and federal resource agencies have policies and guidelines for selecting suitable mitigation measures. These guidelines direct agencies to first consider mitigation measures that will avoid an identified impact; second, mitigation measures that will minimize the impact (i.e., project modifications designed to minimize the extent, intensity, or duration of an impact); and third, mitigation measures that will compensate for the impact (i.e., mitigation measures designed to compensate for an unavoidable impact). These three types of mitigation measures were considered for each identified impact. Where feasible and practicable, modifications to the project alternatives to avoid impacts were considered and incorporated into the project design. Where avoidance was deemed infeasible and impacts unavoidable, mitigation measures designed to minimize impacts (habitat restoration and/or enhancement) and/or to compensate for unavoidable impacts (habitat creation) are presented.

Photographs were taken to portray wetland areas and habitats that could be affected by the BART–San Francisco Airport Extension. These photographs are presented in Figures 3.7-3 and 3.7-4.

Project-Specific Analysis

Mainline from Colma to Burlingame

1. *The Aerial Design Option LPA mainline from Colma to Burlingame would require the displacement of wetlands and other "waters of the U.S." The wetland area permanently displaced or impacted by these measures totals approximately 1.006 acres. (S)*

   Impacted wetlands and "waters of the U.S." discussed here are based on the Section 404 permit application submitted by BART to the ACOE in February 1996. Impacted areas listed in this section differ slightly from those shown in the Section 404 permit application, due to changes in project design made in response to comments on the Section 404 Public Notice. These design changes include the elimination of the proposed car wash and its access road on the west of Bayshore parcel and the removal of the proposed sound wall west of the CalTrain tracks. The specific wetland areas that have been changed are listed in Table 3.7-1. For added details on project design and site features, please refer to the Section 404 Public Notice on the BART permit application in Volume V of this FEIR/FEIS.

   Wetlands and other "waters of the U.S." under ACOE jurisdiction which would be permanently displaced as a result of the Aerial Design Option LPA mainline occur in four areas: 1) Colma Creek; 2) the drainage swale north of the San Bruno CalTrain Station; 3) Cupid Row Canal; and 4) the mainline tracks along the west of Bayshore parcel area. Each area impacted by the Aerial Design Option LPA mainline is shown in Figure 3.7-5 and listed in Table 3.7-2; specific locations impacted are described below.

   Colma Creek. Several modifications are proposed for the project reach of Colma Creek (approximately 5,400 linear feet) to provide 100-year flood protection while accommodating the proposed BART alignment and Hickey Station. Colma Creek currently flows through a concrete-lined channel, which has about a 10-year flood capacity in the vicinity of the proposed project alignment. There are no important biological resources associated with this creek. Proposed modifications which would result in a permanent loss of creek habitat are discussed below.

1: South Lomita Canal South of Pump Station, *Facing North*

2: Drainage Channel beneath SPTCo Tracks at South End of SFIA Property, where it flows into South Lomita Canal, *Facing West*

3: Seasonal Wetland (Foreground)just West of Airport Interchange,*Facing Southeast*

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Wetland Areas on SFIA Property West of Highway 101

FIGURE 3.7-3

1: Colma Creek from Hickey Station Site, *Facing Northwest*

2: Chestnut Station Site, Colma Creek and Spur Track from Kaiser 4th Floor Parking Structure, *Facing Southeast*

3: Seasonal Wetland North of South Spruce Street next to SPTCo Tracks, *Facing Northwest*

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Wetland Areas along Colma Creek

FIGURE 3.7-4

Table 3.7-1
Wetland Impacts Changed Since Submittal of
Section 404 Permit Application to the
U.S. Army Corps of Engineers for the BART–SFIA Extension

Impacted Site	Area of Impact Listed in 404 Application (acres)	Revised Area of Impact (acres)	Reason for Change
Wetlands Permanently Displaced			
1. *Drainage Ditch East of San Felipe Avenue* West of CalTrain tracks (Site 2-4c, Drawing 12, Sheet 73)	0.02	0.003	Culvert not extended due to relocation of soundwall.
2. *Northern Reach of San Felipe Canal* Main drainage west of CalTrain tracks (Site 2-5a, Drawing 13, Sheet 72)	0.002	0	Culvert not extended because soundwall moved.
3. *Northern Reach of San Felipe Canal* Main drainage east of CalTrain tracks (Site 2-5b, Drawing 13, Sheet 72)	0.05	0.04	Culvert not extended due to removal of car wash access road.
4. *Seasonal Wetland Near Northern Portion of San Felipe Canal* (Site 2-5c, Drawing 13, Sheet 72)	0.36	0.29	Car wash access road removed; retaining wall moved.
5. *San Felipe Canal* (Site 2-6a, Drawing 14, Sheet 65)	0	0.002	Canal will not be rerouted because car wash access removed. Therefore, three aerial wye columns displace some canal area.
6. *Seasonal Wetland Near Southern Portion of San Felipe Canal* (Site 2-7a, Drawing 15, Sheet 64)	0.17	0.12	Car wash removed from west of Bayshore parcel.
7. *Small Drainage Ditch at* Southern Portion of San Felipe Canal (Site 2-7b, Drawing 15, Sheet 64)	0.01	0.003	Portion to be converted into a culvert reduced due to car wash removal.
8. *Seasonal Wetland* Vicinity of San Felipe Canal (Site 2-6b, Drawing 14, Sheet 65)	0.02	0	Incorrectly shown as permanent impact in 404 application. Corrected in Mitigation Plan. Impact is temporary.
Total Reduction in Area of Permanently Displaced Wetlands:	0.174		

Table 3.7-1 (continued)
Wetland Impacts Changed Since Submittal of
Section 404 Permit Application to the
U.S. Army Corps of Engineers for the BART–SFIA Extension

Impacted Site	Area of Impact Listed in 404 Application (acres)	Revised Area of Impact (acres)	Reason for Change
Temporary Impacts Due to Construction Activities			
9. *Drainage Ditch* West of CalTrain Tracks, Northeastern Branch, Vicinity of San Felipe Avenue (Site 2-4a, Drawing 12, Sheet 73)	0.02	0	Soundwall moved.
10. *Drainage Ditch* West of CalTrain Tracks, Southerly Branch (Site 2-4b, Drawing 12, Sheet 73)	0.02	0	Soundwall moved.
11. *San Felipe Canal* Proposed Northern Aerial Wye Intersection (Site 2-6a, Drawing 14, Sheet 65)	0.16	0.013	Access road to car wash removed; therefore canal not realigned; remaining impact due to excavation for column footings.
12. *Main Tributary Concrete Ditch* To southern reach of South Lomita Canal, west of CalTrain Tracks (Site 2-10a, Drawing 18, Sheet 47)	0.05	0	Tributary will not be rerouted in order to allow proper drainage.
13. *Seasonal Wetland Along San Felipe Canal and Tip of South Lomita Canal* (Drawing 17, Sheet 55, and Sheet 63)	0	0.1	Impact of 10-foot-wide construction zone added due to more specific engineering planning.
14. *Seasonal Wetland* Vicinity of San Felipe Canal (Site 2-6b,)	0	0.02	Incorrectly shown as permanent impact 404 application. Corrected in Mitigation Plan. Impact is construction-related, and therefore temporary.
15. *Seasonal Wetland Next to Highway 101* Southern part under and between Aerial Wye Stub Legs (Site 2-8, Drawing 16, Sheet 61)	0.33	0.86	Area has long–term temporary impact to habitat under Section 7. No addition under 404.

Table 3.7-1 (continued)
Wetland Impacts Changed Since Submittal of
Section 404 Permit Application to the
U.S. Army Corps of Engineers for the BART–SFIA Extension

Impacted Site	Area of Impact Listed in 404 Application (acres)	Revised Area of Impact (acres)	Reason for Change
16. *Seasonal Wetland Next to Highway 101*			
Northern Part (Site 2-8, Drawing 16, Sheet 61)	0	0.16	Area has long-term temporary impact to habitat under Section 7; no addition under 404.
Total Decrease in Construction Impacts Due to Design Changes:	0.137		
Total Increase in Construction Impacts Due to Corrections:	0.02		
Total Increase in Wetlands Mitigated Under Section 7:		0.69	
Temporary Construction-Related Impacts to Wetlands:		0.573	

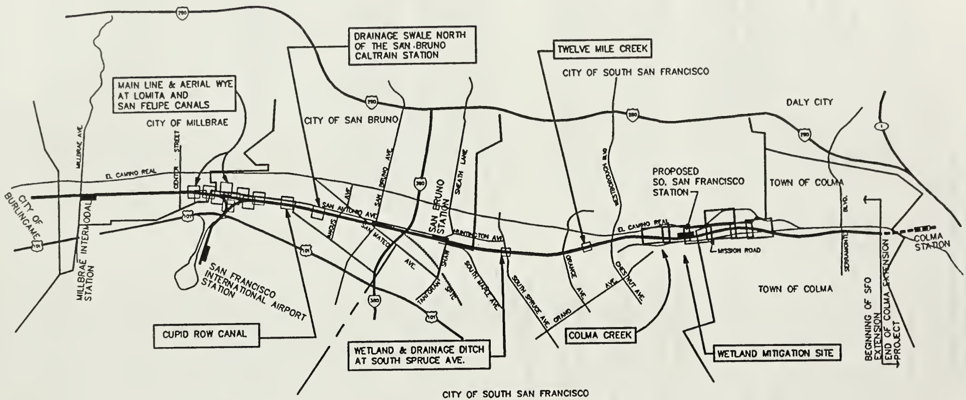

FIGURE 3.7-5

Wetland Impact Sites Location Map

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Table 3.7-2
Estimated Area of Wetlands
Permanently Displaced by the BART-SFIA Extension

Impacted Site[1]	Displacement Feature	Area of Impact (Acres)	Habitat for San Francisco Garter Snake[2]	Proposed Mitigation Ratio[3]
Wetlands Impacted by the Mainline				
1. *Colma Creek* The vicinity of the proposed Hickey Station (Site 1-1b, Drawing 4, Sheet 9)	Converted to Box Culverts Under Station	0.46	No	404: 1:1 Sec. 7: none
2. *Drainage Swale to Colma Creek* At proposed Hickey Station Parking Lot (Site 1-1c, Drawing 4, Sheet 9)	Converted to Box Culvert Under Station Parking Facility	0.03	No	404: 1:1 Sect. 7: none
3. *Drainage Swale North of San Bruno CalTrain Station* Between CalTrain track and Huntington Ave. (Site 2-2, Drawing 9, Sheet 35)	Filled for Power Gap Breaker Building	0.01	No	404: 1:1 Sect. 7: none
4. *Tributary Channel to Cupid Row Canal* Northern Tributary (reach between existing Cupid Row Canal alignment and new proposed alignment) (Site 2-3b, Drawing 10, Sheet 40)	Mainline Alignment	0.01	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
5. *San Felipe Canal* Main Drainage, East of the CalTrain Tracks (Site 2-5b, Drawing 13, Sheet 72)[4]	Converted to Culvert Under Tracks	0.04	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
6. *Seasonal Wetland* Along Northern San Felipe Canal East of CalTrain tracks (Site 2-5c, Drawing 13, Sheet 72)[4]	Mainline Alignment	0.29	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
7. *Drainage Ditch* East of San Felipe Ave. and East of CalTrain Tracks to Edge of SFIA West-of-Bayshore Parcel (Site 2-4c, Drawing 12, Sheet 73)[4]	Converted to Culvert Under Tracks	0.003	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site

Table 3.7-2 (continued)
Estimated Area of Wetlands
Permanently Displaced by the BART-SFIA Extension

Impacted Site[1]	Displacement Feature	Area of Impact (Acres)	Habitat for San Francisco Garter Snake[2]	Proposed Mitigation Ratio[3]
Wetlands Impacted by the Mainline (continued)				
8. *Seasonal Wetland* Vicinity of Southern San Felipe Canal between Aerial Wye Stub Legs (Site 2-7a, Drawing 15, Sheet 64)[4]	Mainline Alignment	0.12	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
9. *Small Drainage Ditch* Just South of Site 2-7a (Site 2-7b, Drawing 15, Sheet 64)[3]	Converted to Culvert Under Tracks	0.003	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
10. *Seasonal Wetland* West of the CalTrain Tracks just North of the Tributary to South Lomita Canal (Site 2-10c, Drawing 18, Sheet 47)	New Alignment of Western Tributary to South Lomita Canal for Southern Portal	0.02	No	404: 1:1 and Sect. 7: none
11. *Tributary Channel* Into South Lomita Canal East of the CalTrain Tracks (Site 2-10b, Drawing 18, Sheet 47)	Southern Portal of Mainline Alignment	0.02	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
Wetlands Impacted by Aerial Wye				
12. *San Felipe Canal* (Site 2-6a, Drawing 14, Sheet 65)[4]	Three Columns of Northern Aerial Wye	0.002	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
13. *Seasonal Wetland just west of Highway 101* (Site 2-8, Drawing 16, Sheet 61)[5]	Four Columns of Northern Aerial Wye	0.003	Yes	404: 3:1 and Sect. 7: 3:1 on site or 5:1 off site
	New PG&E Tubular Towers	0.01	Yes	404: 3:1 Sect. 7: 3:1 on site or 5:1 off site

Table 3.7-2 (continued)
Estimated Area of Wetlands
Permanently Displaced by the BART-SFIA Extension

Impacted Site[1]	Displacement Feature	Area of Impact (Acres)	Habitat for San Francisco Garter Snake[2]	Proposed Mitigation Ratio[3]
Total Area of Wetlands Permanently Displaced by Mainline:		1.006		
Total Area of Wetlands Permanently Displaced by the Aerial Wye:		0.015		
Total Area of Displaced Wetlands which are Not SFGS Habitat:		0.52		
Total Area of Displaced Wetlands which are SFGS Habitat:		0.501		
Total Area of Habitat and Non-Habitat Wetlands Permanently Displaced by Mainline and Aerial Wye:		1.021		

Notes:

1 Impact sites are identified by the site identification number and drawing in Appendix A of the Section 404 Mitigation and Restoration Proposal and the sheet number in the 404 application.

2 SFGS habitat includes habitat for the red-legged frog and the San Francisco forktail damselfly. The habitat area is on and in the vicinity of the west of Bayshore parcel.

3 Impacts to wetlands which are SFGS habitat are proposed to be mitigated under both Section 404 of the Clean Water Act and Section 7 of the Endangered Species Act.

4 Impact has been reduced due to project design changes since the 404 application was submitted.

5 These areas are part of an 0.86-acre seasonal wetland impacted by long-term temporary construction activities. Mitigation is proposed for both the permanent displacement and the long-term temporary impacts to sensitive species.

- **Box Culverts.** The existing concrete channel of Colma Creek in the vicinity of the Hickey Station would be buried beneath the station in concrete box culverts. This would result in the loss of approximately 20,000 square feet (0.46 acres) of jurisdictional area.

- **Drainage Swale.** A small wetland swale at the site of the Hickey Station parking lot would be covered and replaced by an underground box culvert. Approximately 1,300 square feet (0.03 acres) of wetland swale would be permanently displaced.

These two proposed actions would eliminate approximately 0.49 acres of wetlands and other jurisdictional areas associated with Colma Creek. The loss of these habitat areas would be unavoidable.

Drainage Swale North of the San Bruno CalTrain Station. A small ephemeral drainage swale located just north of the existing San Bruno CalTrain Station platform would be filled with concrete and thus permanently displaced by the construction of a BART traction power gap breaker building. The swale occurs between the CalTrain track alignment (to the east) and Huntington Avenue (to the west) and conveys stormwater from Huntington Avenue to a culvert under the CalTrain tracks. Approximately 250 square feet (0.01 acres) of the swale would be filled. The loss of this habitat area would be unavoidable.

- **West of Bayshore Area.** The mainline tracks within and in the vicinity of the west of Bayshore parcel would permanently impact the following areas: a portion of Cupid Row Canal, northern and southern portions of San Felipe Canal, and the southern portion of South Lomita Canal. Permanent impacts to wetlands and other "waters of the U.S." in these areas are discussed below.

- **Cupid Row Canal.** The western section of Cupid Row Canal would be rerouted to the north (as described in Impact 2) to accommodate the mainline alignment, resulting in the permanent displacement of a portion of a tributary channel to the north of the canal. South of the new channel route, 55 linear feet, or approximately 385 square feet (0.01 acres), of the existing channel would be filled and graded. The loss of this habitat area would be unavoidable. The remaining 330 feet of the tributary channel would be restored to its present condition and at its current location following completion of the project.

- **Northern Portion of San Felipe Canal.** Three wetland areas along the northern portion of the San Felipe Canal would be disturbed by the mainline tracks. San Felipe Canal flows from the west to the east through two culverts under the railroad tracks into an open channel and onto the west of Bayshore parcel. The existing culverts would be extended under the BART track alignment into the west of Bayshore parcel, placing approximately 0.04 acres of open channel jurisdictional waters in a culvert. This open channel and associated habitats would be permanently lost. Upon exiting the new culverts, the flow would be rerouted into the existing San Felipe Canal, which would be left in place and run alongside a new retaining wall.

  Seasonal Wetland. A seasonal wetland immediately downstream of the San Felipe Canal entrance to the west of Bayshore parcel would be permanently displaced by the proposed BART track alignment. Approximately 0.29 acres of wetland habitat would be lost.

Drainage Ditch. An open portion of a drainage ditch on the east side of the CalTrain tracks would be converted to a culvert to accommodate the BART at-grade tracks. The ditch currently flows from the east side of San Felipe Avenue, through a culvert under the CalTrain tracks, to the west of Bayshore parcel. The extension of the existing culvert would displace approximately 0.003 acres of open water.

- **Southern Portion of San Felipe Canal.** Two wetland areas along the southern portion of San Felipe Canal would be disturbed by the BART tracks. An existing seasonal wetland in the vicinity of San Felipe Canal would be replaced by the BART mainline tracks. This action would permanently displace approximately 5,230 square feet (0.12 acres) of seasonal wetlands. The loss of this habitat would be unavoidable.

  Small Drainage Ditch. At the southern portion of San Felipe Canal is a small, open stormwater drainage ditch that currently flows east to San Felipe Canal from a concrete pipe near the intersection of San Antonio and Santa Clara Avenues. The easternmost reach of this ditch would be replaced by a culvert along the existing flow path to allow flow to continue under the BART mainline tracks and into the San Felipe Canal. Placement of the ditch in the culvert would permanently remove approximately 130 square feet (0.003 acres) of existing open channel habitat.

- **Southern Portion of South Lomita Canal.** Wetlands in the vicinity of South Lomita Canal that would be affected by the BART mainline tracks are described below.

  Seasonal Wetland. A portion of South Lomita Canal to be rerouted to the north (described in Impact 2) would be concrete-lined and would displace approximately 0.02 acres of seasonal wetland habitat that occurs in the new alignment of the channel. This loss of seasonal wetland would be unavoidable.

  Tributary Channel. Approximately 80 linear feet of an unlined tributary channel immediately east of the CalTrain tracks would be filled to accommodate the southern portal of the BART mainline alignment. This action would remove approximately 0.02 acres of jurisdictional waters. The channel currently flows from a culvert under the CalTrain tracks. A new box culvert would be constructed under the CalTrain and BART tracks to discharge directly into South Lomita Canal. The remaining portion of the unlined channel would be maintained in its original state to receive drainage from the Madrone Street ditch.

MITIGATION MEASURES. The Mainline Alignment of the Aerial Design Option LPA would permanently displace approximately 1.006 acres of wetland habitats and other "waters of the U.S." These permanent impacts will be compensated for at ratios of 3:1 (area of mitigation: area of impact) for those wetlands on or in the immediate vicinity of the west of Bayshore parcel that support the endangered SFGS and/or threatened red-legged frog, and 1:1 for those wetlands elsewhere along the proposed alignment. These mitigation ratios have been designed both to meet resource agencies' policy of no net loss of wetlands policy and to recognize the value of the endangered species wetland habitats. (For more details on proposed mitigation measures for impacts to the SFGS and red-legged frog see Impact 3 below.) The required mitigation area for the impacts, using mitigation ratios noted above, would be 2.02 acres (0.5 acres of non-sensitive species wetland habitat x 1, + 0.506 acres of sensitive species wetland habitat x 3) for the mainline impacts and 0.045 acres (0.015 acres of sensitive species wetland habitat x 3) for the aerial wye

impacts (see Impact 4). The total wetland mitigation area would be 2.065 acres. Implementation of the following mitigation measure would reduce the impact to an insignificant level.

1.1 *Creation of Creekside and/or Seasonal Wetland Habitats of Equal Wildlife Habitat Values.* The mitigation site for unavoidable, permanent impacts to wetlands and other "waters of the U.S." will be located on the north side of Colma Creek, immediately south of the proposed Hickey Station (see Figure 3.7-6). The site consists of land owned by the City and County of San Francisco Water Department and the SPTCo. The parcels are approximately 4.2 acres in size and are within the old Muni right-of-way and above the proposed BART underground alignment. The parcels do not contain any areas which qualify as "waters of the U.S.," as defined by the Clean Water Act. The abandoned Muni tracks lie within the parcel. The surrounding habitats consist of highly disturbed, ruderal vegetation dominated by non-native grasses and forbs, with scattered thickets of coyote bush (*Baccharis pilularis*) and willows (*Salix* sp.).

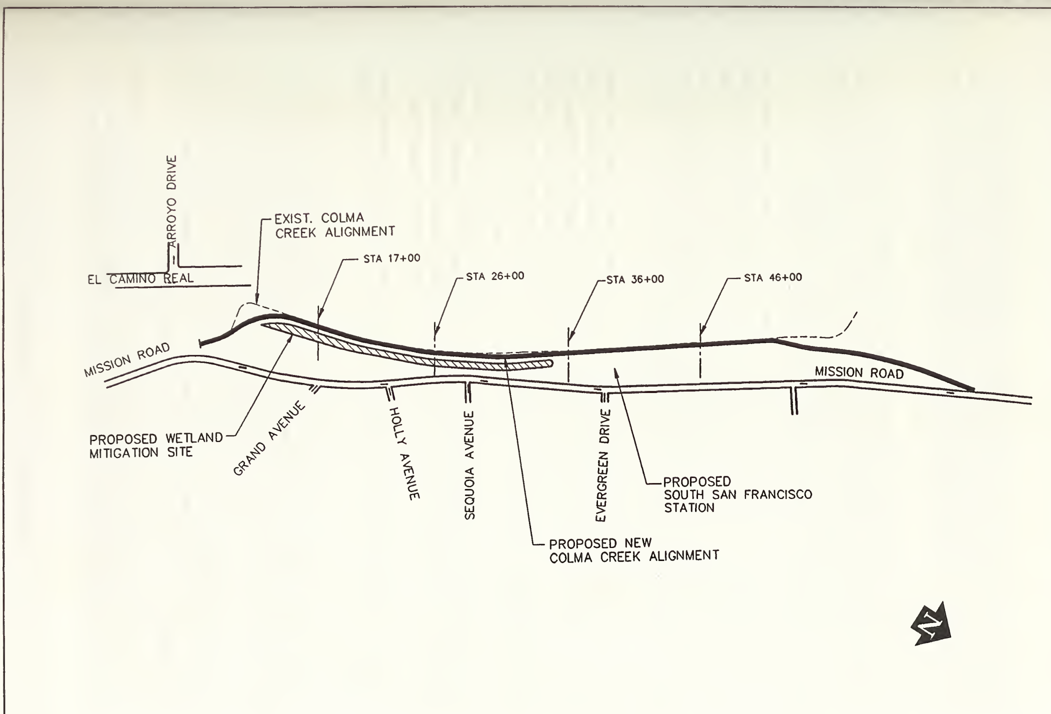
BART proposes to create a year-round, low-velocity creek channel and associated wetland habitat at this site. The water for the creek channel will come from an upstream diversion point on Colma Creek which has some flow year-round. The mitigation plan (see Volume V appendix, Mitigation and Restoration Proposal, for details) includes an oil-water and sediment separator, a series of drop or grade-control structures to create riffles, inlet and outlet structures, and flat-bottom pools. The banks will be planted with species typical of emergent wetlands, transitional uplands, and riparian habitats. BART is currently working with the San Mateo County Flood Control District (SMCFCD) on the flood capacity improvements along this reach of Colma Creek. BART is also seeking to obtain a commitment from the SMCFCD to provide water in perpetuity to the proposed mitigation site. There are no known proposed projects that would substantially reduce the flows to this reach of Colma Creek. The water quality in the creek is believed to be clean enough to support the proposed wetlands, but a water quality analysis will be necessary prior to building the mitigation wetland to confirm this assumption. The proposed mitigation wetlands would provide many of the same functions as the replaced wetlands (i.e. wildlife habitat, water conveyance, and water quality improvement) but would not provide habitat for the SFGS and red-legged frog. These values are to be compensated for at other proposed locations, as described under Impact 3, below.

The mitigation plan complies with Section 404 permit conditions established by the ACOE. The complete Section 404 Public Notice and mitigation plan can be found in Volume V of this FEIR/FEIS.

2. *The Aerial Design Option LPA mainline from Colma to Burlingame would require the redirection and/or modification of wetlands and other "waters of the U.S." The wetland areas permanently impacted by these measures total approximately 0.09 acres. (S)*

While Impact 1, above, addressed permanent displacement of wetlands, this impact analysis concerns modification of wetlands in two areas, Cupid Row Canal and South Lomita Canal.

Cupid Row Canal Realignment. An open, earthen portion of Cupid Row Canal would be relocated to the north because there is not adequate space between the bottom of the existing creek and the top of the BART cut-and-cover alignment. Where the canal exits a culvert under



OGDEN

Mitigation Location Map

FIGURE 3.7-6

Huntington Avenue, a new channel would be constructed to direct the flow approximately 75 feet north into two new concrete box culverts under the CalTrain tracks. The new canal route would flow above the BART alignment through a new channel, then enter two new concrete box culverts under an entrance road. The canal would then be directed back into the original Cupid Row Canal east of the access road.

The abandoned reach of the existing canal, including the railroad and access road culverts, would be filled, sloped to drain, and restored to match surrounding conditions. The filled jurisdictional area (approximately 2,660 square feet, or 0.06 acres) would be nearly equivalent to the amount of new open channel habitat that would be created (approximately 3,100 square feet, or 0.07 acres). The impacts would therefore be mitigated at the site when the project is completed.

Southern Portion of South Lomita Canal. Near the southern portion of South Lomita Canal, two culverts under the CalTrain tracks would be abandoned and filled to accommodate placement of the southern portal of the BART mainline. The culverts direct stormwater flow from a concrete-lined channel on the west side of the tracks. The concrete-lined channel would remain in place but would flow into a new concrete-lined channel to the north, and the new channel would flow through a new box culvert under the CalTrain tracks. Since the existing channel will remain, the culverts replaced, and a new channel added, there an increase in open channel.

In addition, an unlined tributary channel on the east side of the tracks which flows into South Lomita Canal would be rerouted east of the southern portal of the BART mainline alignment. The tributary channel receives stormwater from a drainage ditch on the east side of the CalTrain tracks near Madrone Street. The rerouted earthen channel would be approximately the same width and length as the existing ditch (approximately 1,300 square feet, or 0.03 acres) and thus would mitigate the loss of the original ditch onsite.

MITIGATION MEASURES. The Aerial Design Option LPA would permanently redirect and/or modify approximately 0.09 acres of wetland habitats and other "waters of the U.S." These impacts will be compensated for at a ratio of 1:1 through relocation of each impacted area, as described above. Implementation of these mitigation measures would reduce the impact to an insignificant level.

3. *The mainline tracks of the Aerial Design Option LPA would result in the displacement and/or disturbances of habitats that support the SFGS, the red-legged frog, and the San Francisco forktail damselfly. (S)*

The freshwater wetland habitats on and in the immediate vicinity of the west of Bayshore parcel are considered potential habitat for the red-legged frog, San Francisco forktail damselfly, and SFGS. The SFGS also uses rodent burrows in the adjacent upland habitats for hibernacula (winter shelter), and thus the entire west of Bayshore parcel is considered potential habitat for the SFGS. Recent studies indicate a significant decline in the SFGS population on the west of Bayshore parcel, as well as in other known populations throughout the species range; thus, the USFWS considers any disruption to the life requirements of the SFGS on the west of Bayshore parcel to be significant and, if left unmitigated, could result in the extirpation of this population (Willy, 1995).

Potential project disturbances to the habitats used by the three sensitive wildlife species include both temporary and permanent impacts. Temporary impacts are those associated with short-term construction activities (approximately six months or less) on wetland and upland habitats that do

not support the SFGS hibernacula. Temporary impacts are discussed later in Section 3.13, Construction. Permanent impacts include both long-term temporary disturbances (greater than six months) from construction activities which extend through one reproductive cycle of the SFGS and wetland and upland habitats that do not support the SFGS hibernacula, and disturbances in which suitable habitats are permanently displaced by project features.

Permanent impacts identified in this section are defined as the removal or destruction of habitats occupied by the SFGS and red-legged frog, due to the design and siting of project facilities. For example, the at-grade, and tunnel portals of the mainline alignment would result in a permanent loss of habitats. Permanently displaced upland habitats within the fenced boundaries of the west of Bayshore parcel, and permanently displaced wetlands within and immediately adjacent to the west of Bayshore parcel, are identified and summarized in Table 3.7-3. Temporary and permanent impacts associated with short-term and/or long-term temporary construction activities are identified and discussed in Section 3.13.

The permanent displacement of upland habitats has been limited in this discussion to those areas within the west of Bayshore parcel because habitat values of uplands outside of the parcel and west of the CalTrain tracks are considered low, due to a lack of food sources or suitable hibernacula. Prior to initiating project construction on the west of Bayshore parcel, BART will conduct a preconstruction survey to better define SFGS upland hibernacula, as indicated by burrows and/or coyote brush *(Baccharis pilularis)*, and thus further refine the estimated impacted area of SFGS upland habitat. Some of the waterways and seasonal wetlands located immediately adjacent to the west of Bayshore parcel provide suitable feeding habitat for the SFGS and are inhabited by the red-legged frog and San Francisco forktail damselfly.

The Aerial Design Option LPA at-grade mainline would fill and displace approximately 2.65 acres of wetland and upland habitats used by the endangered SFGS. Of this 2.65 acres, approximately 0.51 acres are wetlands and/or "waters of the U.S.", some of which support the red-legged frog and San Francisco forktail damselfly. Removal of these wetlands, seasonal drainages, canals, and associated vegetation would result in the reduction of feeding areas, movement corridors, and basking and retreat areas. The remaining 2.14 acres is upland habitat (see Table 3.7-3).

MITIGATION MEASURES. Mitigation measures for this impact have been approved by the USFWS under Section 7 of the FESA. BART has completed its formal consultation with the USFWS and has developed an approved mitigation program. Details of the mitigation plan are presented in the approved Biological Assessment (BA) and Biological Opinion (BO) which are reproduced in Volume V of this FEIR/FEIS. The mitigation measures are designed to assure the continued existence and viability of the SFGS and red-legged frog populations on the west of Bayshore parcel through and beyond the construction period of the proposed Aerial Design Option LPA, thus reducing the potential permanent impacts to an insignificant level.

3.1 *Management and Enhancement of Existing Wetland Habitats.* Measures will be implemented by BART to improve the habitat quality of existing wetlands on the west of Bayshore parcel, thereby enhancing habitat value for the red-legged frog, other amphibians, and the SFGS. These habitat enhancement measures include: 1) hydrologic analysis of the entire 180-acre west of Bayshore parcel, designed to define surface and groundwater movement and water ponding regimes for the various wetlands and water bodies; 2) alteration of culverts to enhance habitat values for the red-legged frog in the seasonal

Table 3.7-3

Estimated Area of San Francisco Garter Snake (SFGS) Habitat Permanently Displaced by the BART Mainline[1]

Impacted Site [2]	Area of Impact (Acres)	Proposed Mitigation Ratio
SFGS Wetland Habitat		
1. *Tributary Channel to Cupid Row Canal* Northern Tributary to Cupid Row Canal (reach between existing Cupid Row Canal alignment and new proposed alignment) (Site 2-3b, Drawing 10, Sheet 40)	0.01	3:1 on site or 5:1 off site
2. *San Felipe Canal* West End of San Felipe Canal East of the CalTrain Tracks (Site 2-10b, Drawing 18, Sheet 47) [3]	0.04	3:1 on site or 5:1 off site
3. *Seasonal Wetland* Northern Seasonal Wetland along San Felipe Canal West of CalTrain tracks (Site 2-5c, Drawing 13, Sheet 72)	0.29	3:1 on site or 5:1 off site
4. *Drainage Ditch* Drainage Ditch East of San Felipe Ave. and East of CalTrain Tracks to Edge of SFIA West-of-Bayshore Parcel (Site 2-4c, Drawing 12, Sheet 73)[3]	0.003	3:1 on site or 5:1 off site
5. *Seasonal Wetland* Southern Seasonal Wetland on San Felipe Canal between Aerial Wye Stub Legs (Site 2-7a, Drawing 15, Sheet 64) [3]	0.12	3:1 on site or 5:1 off site
6. *Small Drainage Ditch* Narrow Drainage just South of Site 2-7a (Site 2-7b, Drawing 15, Sheet 64)[3]	0.003	3:1 on site or 5:1 off site

Table 3.7-3 (continued)

Estimated Area of San Francisco Garter Snake (SFGS) Habitat Permanently Displaced by the BART Mainline[1]

Impacted Site [2]	Area of Impact (Acres)	Proposed Mitigation Ratio
SFGS Wetland Habitat		
7. *Seasonal Wetland* Seasonal Wetland West of the CalTrain Tracks just North of the Tributary to South Lomita Canal (Site 2-10c, Drawing 18, Sheet 47)	0.02	3:1 on site or 5:1 off site
8. *Tributary Channel* Tributary Channel into South Lomita Canal west of the CalTrain Tracks (Site 2-10b, Drawing 18, Sheet 47)	0.02	3:1 on site or 5:1 off site
Total Area of SFGS Wetland Habitat Permanently Displaced:	0.506	
SFGS Upland Habitat		
9. Upland Habitats on SFIA West of Bayshore Property Which Would be Displaced by Proposed Project Features	2.14	3:1 for every wetland acre
Total Area of SFGS Upland Habitat Permanently Displaced:	2.14	
Total Area of SFGS Wetland and Upland Habitat Permanently Displaced by the Mainline:	2.646	

Notes:

1 SFGS habitat includes habitat for the red-legged frog and the San Francisco forktail damselfly. The habitat area is on or in the vicinity of the west of Bayshore parcel.

2 Impact sites are identified by the site identification number and drawing in Appendix A of the Section 404 Mitigation and Restoration Proposal and the sheet number in the 404 application.

3 Impact has been reduced due to project design changes since the 404 application was submitted.

wetlands at the southern end of the west of Bayshore parcel; 3) design and implementation of a USFWS-approved maintenance and management program of the tidal gate on Cupid Row Canal for 20 years, and monitoring of the development of habitats suitable for the red-legged frog for a minimum of five years; 4) implementation of a bullfrog abatement program to eliminate or significantly reduce the bullfrog population for 20 years; and 5) implementation of a capture/feeding program for SFGS during project construction to promote successful maturation of young and survival of adult SFGS. These SFGS and red-legged frogs would be released onto the west of Bayshore site or in the immediate vicinity. These measures were developed during the two-year consultation process with the USFWS, and were selected because of their minimal impact to the landscape, maximum benefit to the SFGS and red-legged frog habitat, and sensitivity to future use of the west of Bayshore parcel. These measures will involve habitat enhancement on the west of Bayshore parcel and thus will require the cooperation and approval of the SFIA, the property owner.

3.2 *Replacement of SFGS Wetland/Upland Habitat.* Habitat replacement includes enhancement of upland and creation of wetland habitats adjacent to the west of Bayshore habitat (referred to as "onsite") which would directly support the onsite population of SFGS and red-legged frogs. The total area of SFGS and red-legged frog wetland habitat that would be permanently displaced for both the mainline track and aerial wye trackway is 0.501 acres (see Table 3.7-2). The USFWS replacement.ratios for wetland creation at this onsite location are 3:1 for permanent impacts to wetlands and three acres of upland habitat for each acres of wetland habitat created. Using these ratios, the USFWS would require BART to create a maximum of approximately 1.5 acres of these wetland in a 5- to 6-acre strip of land adjacent to the west of Bayshore parcel in the vicinity of Santa Helena and San Antonio Avenues in the City of Millbrae. This wetland and upland mitigation area extends south from the existing San Bruno CalTrain Station to just north of Center Street. It is bordered to the east by the right-of-way for the CalTrain system and to the west by Huntington/San Antonio Avenues. The property is approximately 90 feet from the west of Bayshore habitat. Upland areas would be interspersed in the wetland development. The actual amount of wetland habitat that may feasibly be created on this strip of land may be less than the maximum 1.5 acres. That portion of the impact areas that cannot be created at this site will be compensated for at a higher ratio of 5:1 at an off-site location to be determined (see 3.3 below). BART will provide water of sufficient quantity (minimum depth 3.5 feet, maximum depth 5 feet) and quality to support the red-legged frog and provide habitat for releasing captured SFGS. Fencing and/or other appropriate barriers will surround the mitigation area to prevent SFGS access to adjacent residential areas. SFGS access to the larger habitat on the west of Bayshore parcel will be provided through existing drainage culverts. In addition, four dry culverts, 18 to 24 inches in diameter, will be placed under the existing CalTrain tracks and proposed BART tracks to provide free movement of SFGS to the west of Bayshore parcel.

3.3 *Compensation for SFGS Wetland/Upland Habitat.* Habitat compensation is defined as securing and preserving existing SFGS wetland/upland habitat away from the west of Bayshore habitat (referred to as "offsite.") BART will secure existing SFGS habitat at a 5:1 ratio for permanently impacted wetlands. At the 5:1 compensation ratio, BART would be required to purchase, enhance and preserve a maximum of 2.5 acres (0.501x5) of offsite wetlands and 7.5 acres of upland (2.5x3) or a total of 10 acres if no onsite mitigation was

feasible (see mitigation measure 3.2 above) for the identified permanent impacts to wetland habitats inhabited by the SFGS and/or red-legged frog. BART will also provide an endowment for the future maintenance of this habitat, in perpetuity. One possible offsite mitigation site identified during the Section 7 consultation process is a 244-acre parcel of land in the southwestern portion of San Mateo County (Steele Ranch). The property purchased or deeded for compensation would include upland and wetland habitat and would exist as a protected habitat. BART will identify an agency or other entity to maintain the property, using the interest from the endowment. BART will provide an endowment of approximately $50,000 per year to fund maintenance and management activities.

If Steele Ranch cannot be purchased, BART will acquire an alternate parcel approved by the USFWS. If BART cannot secure and preserve a suitable "offsite" location, BART will stop all work that might adversely affect the SFGS and red-legged frog habitat, and consult with the USFWS and CDFG to develop a new mitigation proposal. BART will not restart work that affects the protected species until the USFWS and CDFG have accepted the new mitigation and its implementation is assured.

Aerial Wye-Stub to the SFIA

In addition to Impacts 1 and 2 and 3 of the proposed Aerial Design Option LPA mainline on the west of Bayshore parcel, the aerial wye-stubs would disturb the west of Bayshore parcel. Specific locations of disturbance have been identified in the Section 404 permit Public Notice, which, along with the mitigation plan, can be found in Volume V of this FEIR/FEIS. Specific locations where the aerial wye-stubs to the SFIA would disturb wetlands and/or creek habitats are discussed below.

4. *The aerial wye-stubs across the west of Bayshore parcel to the SFIA would require the displacement of wetlands and other "waters of the U.S." The area permanently impacted by these measures totals approximately 0.015 acres. (S)*

   The aerial structures would disturb two wetland areas, as described below.

   High-Value Seasonal Wetland. In order to allow the BART aerial structures to pass beneath the transmission lines on the west of Bayshore parcel, PG&E would raise the lines by erecting five or six tubular, steel towers adjacent to the proposed BART structures. The only permanent loss of high-value seasonal wetland habitat would occur where up to four of the tubular towers meet the ground. Each tower would be approximately 10 feet in diameter and thus displace approximately 79 square feet of wetland habitat, or a total of approximately 314 square feet (0.01 acres) for the four towers. The permanent impacts associated with this action are unavoidable.

   The aerial track alignment would require the placement of four column structures within a high-value seasonal wetland immediately west of Highway 101 on the west of Bayshore parcel (referred to as wetland F). This action would permanently displace approximately 0.003 acres of wetland habitat. The column structures for the aerial tracks into and out of the SFIA would typically be spaced along the aerial alignment on 80-foot centers. Although the excavation for the concrete footings would disturb a larger area than the area each column would displace, these impacts would be temporary, and the wetlands would be restored in place after construction work is completed (see Section 3.13 later for a discussion of this construction-related impact). The only permanent loss of wetland habitat would occur where the columns meet the ground. Each footing

would have two columns, each with a diameter of 6.33 feet. The four columns would permanently displace approximately 126 square feet (0.003 acres). The permanent impacts associated with this action are unavoidable.

San Felipe Canal. Three columns of the northern aerial wye trackway would be located in a reach of San Felipe Canal. The columns would permanently displace approximately 95 square feet (0.002 acres) of the canal. A portion of San Felipe Canal would be temporarily diverted to the east during construction of the second footing and three columns of the northern aerial wye. At the completion of construction, flow in the San Felipe Canal would be restored to its original location. The restoration of the channel to its original location would compensate for this impact, so that additional mitigation is not required. The permanent impact of the columns is unavoidable.

MITIGATION MEASURES. The aerial track alignment through the west of Bayshore parcel would permanently displace approximately 0.015 acres of wetland habitat and other "waters of the U.S." These impacts will be compensated for at a ratio of 3:1 through implementation of Mitigation Measure 1.1 described above. The total wetland mitigation area required would be 0.045 acres (3x0.015) for the permanent impacts caused by the aerial wye trackway: Implementation of this mitigation measure would reduce the impact to an insignificant level.

5. *The aerial wye-stubs across the west of Bayshore parcel to the SFIA would require the modification of wetlands and other "waters of the U.S." (S)*

Two aerial wye support columns would be placed on each side of the southern end of San Felipe Canal where it empties into South Lomita Canal. San Felipe Canal would be excavated for the support footing and the two columns for the southern aerial trackway. The excavated area would be replaced with concrete for the footing. The channel would be replaced in its original location, and the channel bottom would remain earthen. The east bank would be widened and concrete-lined at this point. The impact of the excavation and concrete fill would be balanced by the additional jurisdictional area created at this site by widening the channel.

MITIGATION MEASURES. The aerial wye would permanently modify wetland habitats and other "waters of the U.S." These impacts will be compensated for by adding jurisdictional area at the site, as described in the impact assessment. Implementation of this mitigation measure would reduce the impact to an insignificant level.

6. *The aerial wye-stub into the SFIA would result in the displacement of upland and wetland habitats that support the SFGS, the red-legged frog, and the San Francisco forktail damselfly. (S)*

The aerial track columns would displace approximately 0.055 acres of upland and wetland habitats that support the endangered SFGS on the west of Bayshore parcel. Of this 0.055 acres, approximately 0.015 acres are wetland habitats also known to support the threatened red-legged frog and the San Francisco forktail damselfly would be permanently displaced. (Specific locations of the wetlands are discussed in Impact 4, above.) The remaining 0.04 acres to be displaced are upland habitat. In addition to the displacement of habitats due to the aerial columns, 0.02 acres of upland and wetland habitat would be displaced by the new tubular towers for the PG&E transmission line over BART. These permanent impacts are summarized in Table 3.7-4.

MITIGATION MEASURES. Implementation of Mitigation Measures 3.1, 3.2, and 3.3 would minimize impacts to threatened and endangered species to an insignificant level. These measures comply

Table 3.7-4

Estimated Area of San Francisco Garter Snake Habitat

Permanently Displaced By The Aerial Wye Alignment[1]

Impacted Site [2]	Area of Impact (Acres)	Proposed Mitigation Ratio
SFGS Wetland Habitat		
1. Northern Aerial Wye Stub Columns in San Felipe Canal (Site 2-6a)[3]	0.002	3:1 on-site or 5:1 off-site
2. Northern Aerial Wye Stub Columns in the Seasonal Wetland just west of Highway 101 (Site 2-8 Drawing 16 Sheet 61)[4]	0.003	3:1 on-site or 5:1 off-site
3. New PG&E Tubular Towers in the Seasonal Wetland just west of Highway 101[4]	0.01	3:1 on-site or 5:1 off-site
Total Area of SFGS Wetland Habitat Permanently Displaced by the Aerial Wye:	0.015	
SFGS Upland Habitat		
4. New PG&E Tubular Towers in Upland West of Highway 101	0.01	3:1 for every wetland acre
5. BART Aerial Wye Columns	0.03	3:1 for every wetland acre
Total Area of SFGS Upland Habitat Permanently Displaced by the Aerial Wye:	0.04	
Total Area of Wetland and Upland Habitat Permanently Displaced by the Aerial Wye:	0.055	

Notes:

1 SFGS habitat includes habitat for the red-legged frog and the San Francisco forktail damselfly. The habitat area is on or in the vicinity of the west of Bayshore parcel.

2 Impact sites are identified by the site identification number and drawing in Appendix A of the Section 404 Mitigation and Restoration Proposal and the sheet number in the 404 application.

3 Impact has been reduced due to recent project design changes since the 404 application was submitted.

4 These areas are included in Table 3.13-4 as part of an 0.86-acre wetland area impacted by long-term construction activities and mitigated for permanent impacts to sensitive species.

with the BA and BO under Section 7 of the FESA. The BA and BO can be found in Volume V of this FEIR/FEIS.

The final amount of SFGS and red-legged frog habitat creation and compensation for both permanent and temporary impacts (described in Section 13) will depend upon the amount of wetland that can feasibly be created at the onsite location. If BART were to only create 0.6 acres of wetlands at the onsite mitigation location (minimal amount assumed by the USFWS) this would adequately replace 0.2 acres of the 0.501 acres of permanently impacted wetlands and thus mean the remaining 0.3 acres would have to be compensated for at the offsite location at 5:1 or 1.5 acres. The offsite compensation would then also have to be used to compensate for all the temporary wetland impact area (see Section 13 for discussion of temporary impacts) or 1.453 acres at a 3:1 ratio for an additional 4.36 acres of wetlands or a total of 5.86 acres (4.36+1.5) of wetlands and 17.58 acres of uplands (3x5.86) for a total offsite mitigation area of 25.44 acres. If BART is able to increase its wetland creation replacement on the onsite location to the maximum 1.5 acres on the six acre parcel then the offsite mitigation site would be reduced to 4.36 acres of wetlands and 13.08 acres of uplands (4.36x3) for a total mitigation area of 17.44 acres. The range of required mitigation area would be between 23.44 acres (6+17.44) to 27.84 acres (1.8 acres of upland onsite + 0.6 acres of wetlands onsite +17.44 acres offsite) depending upon low marsh wetland can be created at the onsite location.

Cumulative Analysis

The criteria used to determine significant cumulative long-term effects of the proposed project on biological resources are identical to those defined for the project-specific impact analysis, and include the loss and/or degradation of wetlands as well as habitats for the SFGS, red-legged frog, and San Francisco forktail damselfly.

The *El Camino Corridor Redevelopment Area Plan* proposes to place the entire Colma Creek channel in a box culvert, from Hickey Boulevard to Chestnut Avenue, in order to encourage development in this area. Impacts associated with placing the channel in a box culvert are in the *El Camino Corridor Redevelopment Plan EIR;* this impact would combine with that of the Aerial Design Option LPA, and result in a significant cumulative impact on wetlands.

No development proposals for the west of Bayshore parcels are currently being considered by the SFIA, and such development was not addressed in the SFIA Master Plan EIR (May 1992). However, certain activities associated with proposed SFIA Master Plan development are likely to directly and/or indirectly affect the SFGS population on the west of Bayshore parcel. These activities would include modifications to the Highway 101 interchange and improvements to adjacent roadways. The addition of supplemental power and water lines to support airport development are expected to traverse the west of Bayshore parcel. Caltrans is proposing to seismically retrofit the southbound SFIA exit ramp to Highway 101, which is expected to impact upland and wetland habitats on the west of Bayshore parcel. A proposed natural gas pipeline extension immediately west of the west of Bayshore parcel would contribute to adverse indirect effects to the SFGS and red-legged frog. There would be significant cumulative effects on sensitive species habitat from site maintenance activities, uncontrolled tidal influences, entrapment of snakes in drains, trespassing vehicles, and bullfrog predation.

Section 8
Hydrology and Water Quality

8.1 Introduction

This section presents a discussion of hydrology and water quality conditions along the project corridor and potential impacts that would occur during operation of the Aerial Design Option LPA. Specific issues addressed include drainage, floodplain development, groundwater, and water quality. The risk of flooding and contamination to groundwater and runoff have the potential to affect the health and safety of BART employees and passengers as well as individuals and businesses residing in the project corridor. Analysis of floodplain development within the project corridor is specifically mandated under Executive Order 11988 of 1979 (Floodplain Managment) and the Federal Water Pollution Control Act Amendments for 1972. Comparable state legislation exists for the protection of water quality. Impacts directly related to construction activities are addressed later in Section 3.13, Construction.

8.2 Existing Conditions

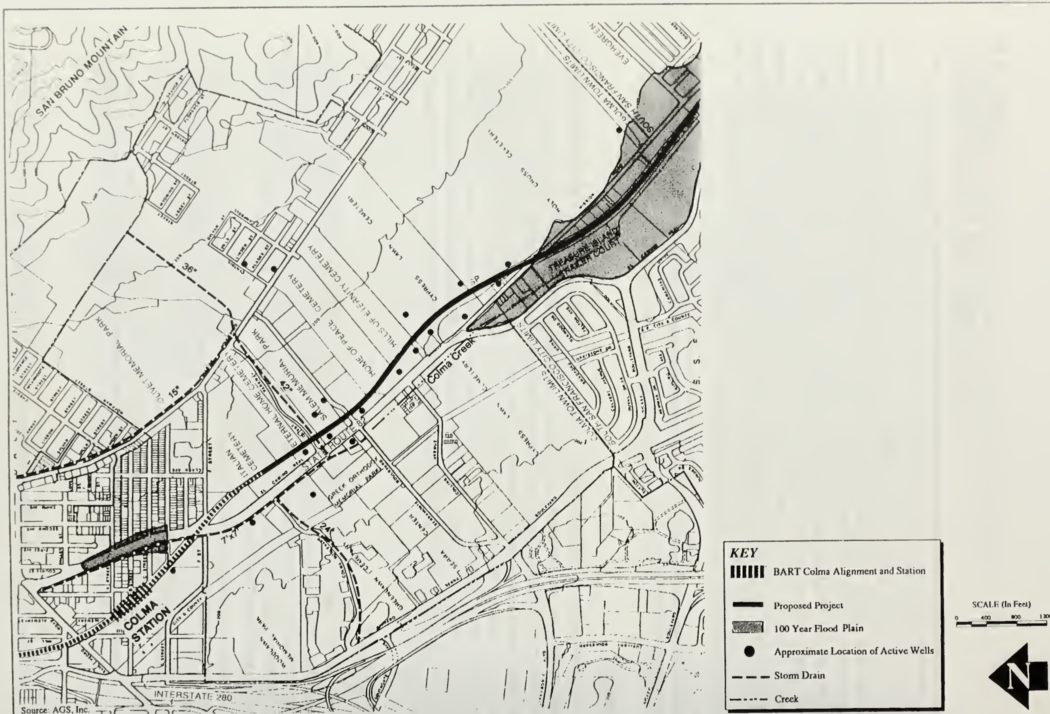
Drainage

The northern portion of the project corridor is within the Colma Creek drainage basin, and the southern portion within the San Francisco Bay flatlands. The Colma Creek drainage basin is a narrow alluvial valley, two to three miles wide, situated between San Bruno Mountain and the coastal hills. The project corridor is near the center line of the valley. There are two main tributary creeks that drain into Colma Creek: Twelve Mile Creek (about 500 feet southeast of the Mission Road/Chestnut Avenue intersection) and Spruce Creek (near Spruce Avenue). In the San Francisco Bay flatlands, drainage is controlled by a system of storm drains and lined creek beds. Shoreline features consist of tidal marshlands that are subject to periodic inundation and exposure during high and low tides. Drainage within the marshland area is typically very poor.

Flood Hazards

Figures 3.8-1 through 3.8-5 show the extent of the 100-year and 500-year floodplains (areas that would be inundated by a storm event with a 1.0 and 0.02 percent probability of occurring, respectively, in any given year), as designated by the Federal Emergency Management Agency (FEMA). The projected depth of flooding in these areas is between 1 and 3 feet. Those portions of the project corridor that encroach into the 100- and 500-year floodplains are identified below.

- Near the intersection of F Street and El Camino Real, the Colma BART Station storm drain merges into the F Street culvert box. Because the downstream storm drain has one-half of the waterway area of the upstream storm drain, the excess flow floods El Camino Real and backs up into the Meadowbrook Mobile Home Park. This can occur in a 50-year storm event, when 1,630 cubic feet per second (cfs) is discharged.
- Since 1974, Daly City, Colma and South San Francisco have undertaken a number of projects to upgrade Colma Creek and collection facilities within the basin to provide conveyance capacity adequate to carry storm flows resulting from a 50-year storm. FEMA maps show flooding around



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Colma Flood Plain Map

FIGURE 3.8-1

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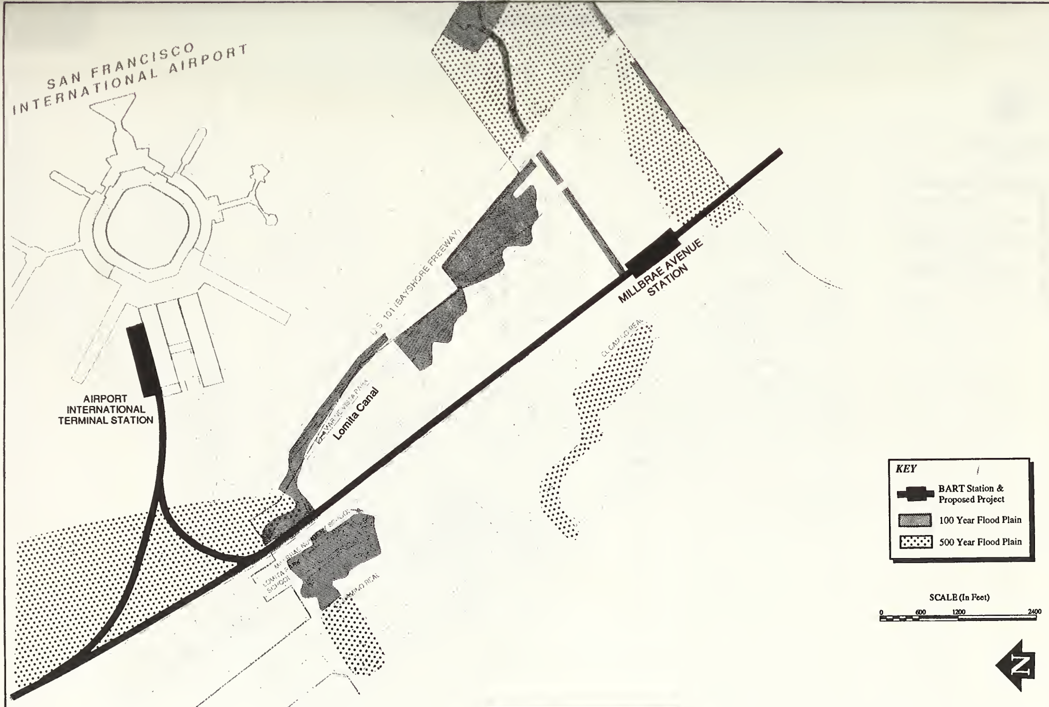
South San Francisco Flood Plain Map

FIGURE 3.8-2

OGDEN

San Bruno Flood Plain Map

FIGURE 3.8-3



OGDEN

Millbrae Flood Plain Map

FIGURE

3.8-4

OGDEN

FIGURE 3.8-5

Burlingame Flood Plain Map

the channel as many areas along Colma Creek are subject to flooding. These localized areas include the entire project corridor along El Camino Real and Mission Road.

- In South San Francisco, flooding occurs from Mission Road to about Oak Avenue, most likely because drainage systems are inadequate to remove stormwaters accumulating in low-lying areas around the Colma Creek Channel. Flooding occurs primarily along the north bank towards Mission Road, because of its lower elevation. At the present time, the San Mateo Flood Control District is preparing a Capital Improvements Plan (CIP) for their planned flood control projects on Colma Creek.
- At the southern end of the project corridor, FEMA maps show 100- and 500-year flood zones between the San Francisco Bay and the SPTCo mainline tracks. The 100-year flood zone extends west of the SPTCo mainline tracks along San Antonio Avenue between San Felipe and San Benito Avenues. The entire SFIA property west of Highway 101 (west of Bayshore parcel) is within the 500-year flood zone. The 100-year flood zone is located within the immediate areas of Cupid Row Canal (also known as Crystal Springs Channel) and San Felipe–South Lomita Canal (also known as Lomita Channel) in San Bruno and Millbrae. Flood conditions created by heavy rains are aggravated by high tides that occur after the main flood peak, causing further backup.
- Although not designated as a FEMA floodplain, the area around the San Bruno Central Business District and west of the CalTrain track has experienced many flooding problems (Foscardo, 1993). The flooding is most likely due to local storm drain systems that are inadequate to drain these low-lying areas.
- The northeastern portion of Burlingame lies within the FEMA-designated 500-year floodplain. The 100-year floodplain is contained within the channel of the El Portal Canal.

Groundwater

The groundwater basin of Colma Creek consists of two water-bearing zones within the Colma and Merced Formations. The Colma aquifer system is the shallower of the two and is multi-layered. The deeper Merced aquifer system appears to be locally confined by relatively impermeable geologic strata. The groundwater flow gradient is from the vicinity of Lake Merced in San Francisco, easterly to the San Francisco Bay. In the southern portions of South San Francisco and in San Bruno, groundwater is found throughout the year just a few feet below the ground surface; during the rainy season, its level rises above the ground surface in many local depressions, leaving standing water in drainage ditches that can remain for months.

During previous exploratory borings at the SFIA, groundwater was encountered at approximately 5 to 8 feet below the ground surface (bgs) (AGS, 1993). Groundwater levels in this area are believed to fluctuate with time and may be affected by tides, rainfall, surface runoff, and other factors. There are 54 known active wells in the project corridor, as shown in Figures 3.8-1 through 3.8-3. The wells tap into the Merced aquifer at a depth to static water of no less than 150 feet and typically more than 200 feet. These wells supply a portion of the drinking and irrigation water for Daly City, Colma, South San Francisco, and San Bruno.

Besides the Colma and Merced Formation aquifers, alluvial deposits of Colma Creek define a shallow groundwater aquifer system. Water level measurements in wells along Colma Creek show a perched water table of approximately 20 feet bgs. Perched water is unconfined groundwater separated from the underlying main aquifer by an impermeable layer.

Water Quality

Within the Colma Creek watershed, all streamflow originates as stormwater runoff. Because most of the area is heavily urbanized, this runoff carries urban pollutants generated by residential, commercial, industrial, and transportation land uses. These pollutants include oil and grease, heavy metals and pesticides, rubber particles, and debris. Although some of these contaminants percolate into the streambed, most of them are discharged directly into the bay, adding to its overall pollutant load. In 1972, the Federal Water Pollution Control Act was amended to outlaw the discharge of pollutants to "waters of the U.S." from any point source (a single discharge point, such as a drainage outlet), unless the discharge is in compliance with a National Pollution Discharge Elimination System (NPDES) permit. While the EPA ultimately administers the NPDES program, responsibility for implementation lies with the State Water Resources Control Board (SWRCB) and its Regional Water Quality Control Boards (RWQCBs).

The program requires NPDES permits for any proposed discharge from a point source into navigable waters, for any wastes discharged into surface waters, and for any stormwater discharge. For example, stormwater discharges associated with construction activities disturbing five or more acres would typically trigger the need for a permit. The stormwater construction permit issued by the SWRCB regulates types and levels of stormwater pollutants allowed during construction. This permit requires the project sponsor to develop and implement stormwater pollution prevention plans to 1) identify sources of sediment and other pollutants that affect stormwater quality, and 2) eliminate or reduce non-stormwater discharges to stormwater by employing Best Management Practices (BMPs). The permit also requires the verification of pollution control measures through implementation of a monitoring program.

8.3 Impact Assessment and Mitigation

Significance Criteria

The Aerial Design Option LPA would have significant project-related and cumulative impacts if it resulted in increased flooding to, or encroachment of project facilities into, the 100-year floodplain; degraded water quality; increased erosion and sedimentation along local drainages; or interfered with groundwater recharge.

Project-Specific Analysis

1. *Portions of the proposed project traverse FEMA-designated 100-year floodplains as well as other undesignated but known flood areas. BART facilities may be flooded in these areas. (S)*

   The cut-and-cover subway section of the proposed project, from 1,000 feet south of the Mission Road/El Camino Real intersection to approximately 3,000 feet south of the Hickey Station, is within the FEMA-designated 100-year floodplain. FEMA flood levels in this area are from 1 to 3 feet. BART facilities such as the Hickey Station, parking, and access roads could be flooded.

   The track alignment would pass under the Cupid Row Canal in cut-and-cover subway at I-380 and south of Lion's Field Park. The segment of tracks and facilities located between these two points, including a proposed ventilation/emergency exit building and a traction power and train control substation, are within the 100-year floodplain and could potentially flood. The proposed project

then traverses 500-year floodplains in the SFIA property west of Highway 101. Although precise information on flooding in this area is unavailable, flooding is known to occur in the low-lying areas east of El Camino Real on the west side of the CalTrain tracks.

Other facilities of concern in the flood-prone SFIA property west of Highway 101 include emergency and service access points, utility service locations, and Highway 101 on- and off-ramps.

MITIGATION MEASURES. The following mitigation measure would reduce the impact of flooding to an insignificant level.

1.1 *Elevation of BART Facilities.* The BART facilities will be designed so that they would not flood during a 100-year storm. The design of BART facilities will provide for sufficient elevation above potential flood levels for the 100-year storm plus a nominal amount of freeboard. Additional protection will be achieved by designing facilities for a 500-year storm plus a reduced amount of freeboard. A 10-year storm will be used as the minimum design criteria for parking lots. Raising BART facilities above flood levels would make the facilities more visible from the surrounding areas.

    Two approaches are possible to develop a safe elevation above flood levels. Under the first approach, a hydrology study would be performed during preliminary engineering by a licensed civil engineer. This study would model the drainage basin and determine the maximum depth and areal extent of flooding. Station facilities would then be designed above the predicted maximum flood levels.

    A hydrology and drainage study has been completed for the northern portion of the extension alignment (i.e., Segment 1, or from Colma Station south to north of Spruce Avenue in South San Francisco). Based on this study, preliminary engineering for an improved Colma Creek Channel from just upstream of the Hickey Station at a point near Mission Road and the northerly end of Antoinette Lane indicates that a redesigned Colma Creek, using a 50-year storm discharge as design criteria, would contain the 50-year discharge with adequate freeboard and the 100-year discharge, with slightly less freeboard, within the concrete lining. Thus, there will be less flooding in the vicinity of the Hickey Station as a result of BART construction.

    The hydrology and drainage study will be extended to cover the entire project during preliminary engineering for Segment 2, which began upon selection of the Aerial Design Option LPA in November 1995 and is projected for completion in September 1996. (Segment 2 extends between just north of South Spruce Avenue to the tailtracks in Burlingame).

    If a hydrology study is not feasible, station facilities will be designed conservatively, above the maximum FEMA flood level. In areas where undesignated but known flooding occurs, a minimum safe elevation of BART facilities will be mutually defined in consultation with BART project engineers, the San Mateo County Flood Control District, Caltrans, and the relevant municipalities.

2. *The Hickey Station is within the FEMA-designated 100-year floodplain. Construction of this station and its parking lots and access roads would require fill, thus removing eight acres currently designated as a floodplain and increasing the risk of flooding to adjacent areas. However,*

proposed design refinements incorporated into the Aerial Design Option LPA would mitigate these effects and provide for the safe conveyance of stormwaters. (I)

The Hickey Station is within the FEMA-designated 100-year floodplain. Construction of this BART station, parking lots, and access roads would require that fill cover an area currently designated as a floodplain. As a result, stormwater from this area would be displaced onto adjacent areas and potentially increase flood depths. In addition, loss of temporary floodplain storage would expand the flood stage further east towards Mission Road in areas immediately upstream and downstream of the Hickey Station.

During a 100-year storm event along Colma Creek under existing conditions, flood waters spill over the banks of the creek. The width of the main floodplain along the creek ranges from 23 feet to 60 feet, with the water depth ranging from 2 to 8 feet above the banks. The proposed Hickey Station and existing facilities would cover approximately 22 acres, eight acres of which are in the floodplain. This fill would displace approximately 4,000 cubic yards of floodplain. The extent of flooding would then increase 1 to 3 feet vertically and 10 to 20 feet horizontally. These changes would affect an area from approximately 200 feet upstream and 200 feet downstream of the Hickey Station. Beyond these areas, there would be no significant change in the flooding limits.

A hydrology study performed by a licensed civil engineer has been completed between the Colma tailtracks and north of South Spruce Avenue in South San Francisco. As a result, the BART-San Francisco Airport Extension has been refined between Mission Road and Oak Avenue to include improvements to existing drainage systems, such as increasing the capacity of channels and storm drains and constructing additional stormwater storage capacity that will reduce the impact to pre-development conditions. Implementation of this design refinement would mitigate potential flood impacts in nearby areas including Treasure Island Trailer Court.

The drainage system improvements to be made are described as Alternative II in the Reimer Associates *Colma Creek Improvements Validation Study* (February 1995), with funding contribution from the San Mateo County Flood Control Zone. A summary of the plan follows:

- Dedicate surface rights to the San Mateo County Flood Control District (SMCFCD) to allow it to construct a new channel within BART right-of-way over the BART cut-and-cover subway between Mission Road and the proposed Hickey BART Station, as proposed in the Reimer Associates Validation Study Report.
- Set the vertical BART subway track alignment such that it will allow the new channel to be constructed over the top of the subway in Segment 1.
- Excavate the area of the new channel cross-section and dispose of the material removed, leaving the shoring piles and backfill in place so as to frame a new channel in the Segment 1.
- Permit the SMCFCD to construct and maintain necessary flood control facilities over the BART subway in the above Segment 1.
- Construct 50-year capacity channel improvements, utilizing concrete lining, from the confluence of the new channel (described above) and the existing Colma Creek at the Treasure Island Trailer Park to Oak Avenue on the current alignment of Colma Creek, contingent upon the SMCFCD contribution to BART of an amount equal to the difference in cost between gabion and concrete channel construction.
- Dedicate the necessary additional easements to the SMCFCD to allow maintenance of the flood control improvements.

- Construct a 100-year capacity concrete box culvert under the new Hickey Station parking lot, with transitions at each end to the 50-year capacity channel improvements.
- Perform the environmental analysis and obtain necessary permits for the aforementioned improvements.

3. *Placement of the mainline tracks through the 100-year floodplain and placement of supporting columns for the aerial guideways in the SFIA west of Bayshore parcel would displace some floodplain storage capacity and increase the potential for flooding in the vicinity. (I)*

   Fill placed to accommodate the mainline tracks as they approach the wye connection, and near South Lomita Canal just north of Madrone Street, would displace some floodplain storage capacity and obstruct overland drainage patterns. This obstruction would not aggravate localized flood conditions in these areas because BART will relocate drainage channels and extend culverts to maintain existing drainage volumes and flows, thereby reducing the impact to an insignificant level.

   The Aerial Design Option LPA would require the placement of columns to support the aerial wye-stub in the SFIA west of Bayshore parcel. This parcel contains lands within the 500-year floodplain. The columns would disrupt overland flow of stormwaters and decrease the capacity of this area to store stormwaters. These effects would be insignificant, however, because the column footings are to be constructed below the level of the existing ground, with only the actual column rising above grade. Furthermore, the columns supporting the aerial facility lie not in the 100-year, but in the 500-year, floodplain.

4. *Station facilities would increase the amount of impermeable surfaces and, in turn, slightly increase the amount of rain that becomes runoff. (I)*

   Construction of the Hickey Station would cover approximately eight acres with impervious surfaces, resulting in increased runoff of 16 cubic feet per second (cfs)[1]. The additional runoff is a small percentage of the total runoff for the watershed and would enter Colma Creek prior to the arrival of peak flood flows from the remainder of the drainage basin above the Hickey Station. The Tanforan Station would contribute only 2 cfs[1] during intense storms and would not be considered a significant source of additional stormwater.

   Construction of the Millbrae Avenue Station would occur on areas that are already covered by a high percentage of impervious surfaces; therefore, less than 1 acre of additional impervious surface would be added, resulting in an increased runoff of 2 cfs.[1] This increase would have an insignificant impact on flooding.

5. *The Aerial Design Option LPA would increase localized erosion of soils where existing drainageways are lined or placed in culverts that discharge into unimproved drainageways or undeveloped areas. (S)*

   Significant erosion may occur at the outlet of any proposed channel or enclosure. This impact could occur at the San Bruno Avenue/Highway 101 off-ramp, where the triple box culvert would be extended, and where the Aerial Design Option LPA would cross existing culverts. These culverts, most of which occur along the SPTCo tracks, would be extended approximately 50 feet and would

1 These figures are approximate, based on conceptual station layouts. Runoff was calculated based on the rational method formula, using a 100-year storm intensity of 2.9 inches per hour.

not significantly affect existing flow velocities. Thus, erosion impacts would not be expected. Section 3.13, Construction/Hydrology and Water Quality, also addresses erosion during the construction period.

MITIGATION MEASURES. The following mitigation measure would reduce the impact of soil erosion to an insignificant level.

5.1 *Installation of Stream Bank Protection.* Stream bank protection will be designed and placed at channel and culvert outlets, according to standard civil engineering practices, to prevent erosion. Stream bank protection measures will be implemented in areas where the velocity of water exiting improved culverts would cause erosion in the natural stream channel. Stream bank protection must extend the length of the transition area, from the outlet of the improved culvert to where the velocities in the natural channel have slowed. These transition areas are generally short relative to the length of the entire channel. Velocities in the natural channel are slower than in smooth concrete channels with the same slope because of the increased roughness and cross-sectional flow area of the natural channel.

Stream bank protection may consist of concrete lining, rip-rap (angular quarry rock of varying large size), sacked concrete (concrete-filled burlap sacks), gabions (wire baskets filled with 6- to 8-inch rocks), or other similar methods. Each method has a distinct impact associated with its use. Some methods, such as gabions, are more conducive to supporting plant growth than concrete lining or sacked concrete. The choice of protection method is dependent on the site and hydraulic conditions, and the appropriate erosion control techniques will be selected during the final design phase by the design-build contractor.

In areas where maintaining habitat is considered important (such as along Cupid Row Canal and South Lomita Canal), measures that retain soil in their voids and aid in establishing plant life will be utilized.

6. *The Aerial Design Option LPA may contribute to local nonpoint source stormwater pollution, as built-up pollutants on parking surfaces wash into storm drains and are discharged into the Bay. (S)*

MITIGATION MEASURES. The following mitigation measures would reduce the impact of nonpoint source pollution to an insignificant level.

6.1 *Oil and Water Separators in Catch Basins.* BART will require in its construction documents that oil and water separators be installed in catch basins located in parking lots to separate contaminants from runoff entering the stormwater system. The effectiveness of these separators depends upon the level of maintenance they receive. BART will periodically clean out these separators depending upon the amount of debris accumulated and before the rainy season.

6.2 *Best Management Practices.* Oil/water separators are generally effective at removing oils and large sediments; they do not, however, remove dissolved toxics or heavy metals that may be suspended in the stormwater runoff. The best way of controlling these compounds is by preventing them from entering the system. To reduce these pollutants, BART will apply best management practices, including regular sweeping of the parking areas, strict adherence to guidelines regarding application of fertilizers and pesticides in landscaped areas, and regular cleaning and maintenance of catch basins.

7. *Loss of aquifer recharge potential would occur but would be insignificant because of the overall permeable surface available in the drainage basin. (I)*

8. *The potential exists for contamination of the Colma/Merced aquifers along below-grade portions of the Aerial Design Option LPA alignment that penetrate through an impermeable layer below contaminated perched water, specifically between the Colma tailtracks and South Spruce Avenue, and between I-380 and Cupid Row. Contaminated perched water may seep along the wall of the below-grade structure and through the backfill of the excavation. (S)*

   Perched water is known to occur along the project corridor. Perched water is groundwater that is trapped, typically above an impermeable layer of soil. Penetrating this impervious layer of soil provides an avenue for perched water to seep into the underlying groundwater system. The perched water is of unknown quality, and the potential exists that it may be contaminated due to long-term industrial use of the Colma, South Spruce Avenue, South San Francisco, and Oyster Point areas. The underlying aquifer may become contaminated by mingling with polluted perched water.

   MITIGATION MEASURES. The following mitigation measure would reduce the impact of contamination, should it occur, to an insignificant level.

   8.1 *Use of Grout Sealant or other Equivalent Measures.* To prevent contaminated perched water from seeping through the penetrated impervious layer, the breach will be sealed with a grout sealant, slurry walls, cut-off casing, or other appropriate methods based on results of a site-specific geotechnical investigation performed during project design.

   The Aerial Design Option LPA would require the placement of columns to support the aerial wye-stub in the SFIA west of Bayshore parcel. This parcel contains lands within the 500-year floodplain. The columns would disrupt overland flow of stormwaters and decrease the capacity of this area to store stormwaters. These effects would be insignificant, however, because the column footings are to be constructed below the level of the existing ground, with only the actual column rising above grade. Furthermore, the columns supporting the aerial facility lie not in the 100-year, but in the 500-year, floodplain.

9. *Reconstruction of a stretch of Colma Creek in South San Francisco under the proposed project would improve the discharge of stormwaters. (B)*

   The proposed project alignment is either below grade or along the existing grade of the SPTCo rail line and will not adversely affect overland drainage patterns. The Hickey Station site will entail the enclosure of Colma Creek in a box culvert. This will increase the capacity of Colma Creek. The improved hydraulic characteristics of Colma Creek will reduce upstream flooding to some extent.

Cumulative Analysis

The significance criteria used in the project-specific analysis also apply to the cumulative analysis. Population growth, as forecast in ABAG's *Projections '94* for the Bay Area, and associated development would increase the potential for hydrology and water quality impacts, but these impacts would be controlled by policies and land uses defined in local and regional general plans. In addition to the BART extension, other current pending projects within the study area include development envisioned in the SFIA Master Plan and the *El Camino Corridor Redevelopment Plan*.

Since there are no planned developments on the west of Bayshore parcel other than the BART extension, cumulative hydrology or water quality impacts west of Highway 101 would not occur.

The City of South San Francisco is proposing to develop high density residences around the Hickey Station. This development, in conjunction with the Hickey Station facilities, could increase nonpoint source pollution, through increased runoff from impermeable surfaces. This cumulative impact would be mitigated to an insignificant level through the use of oil and water separators in catch basins and best management practices, or equivalent mitigation measures. The City of South San Francisco would also be required to provide appropriate mitigation measures for its residential project, similar to those proposed by BART.

Section 9
Noise and Vibration

9.1 Introduction

This section describes the existing, or ambient, noise and vibration conditions and projected impacts associated with operation of the BART–San Francisco Airport Extension within the project corridor. Impacts directly related to construction activities are addressed later in Section 3.13, Construction. Noise is simply defined as "unwanted sound" and is measured in units of decibels (dB). To acknowledge the fact that humans hear sound at certain frequencies better than others, the decibels are weighted, or adjusted to correspond to the human range of hearing. A frequently used weighting scale is the A-weighting scale, with decibels denoted as dBA. Typical sound levels from common noise sources are shown in Figure 3.9-1.

Noise that is transmitted through the air is referred to as "airborne noise." "Groundborne vibration" is the transmission of energy through the earth. It is also quantified using decibels. Groundborne vibration, if strong enough to be perceptible, is sensed as motion of the floors or walls inside a building. The low-pitched, rumbling noise that can result from groundborne vibration is called "groundborne noise."

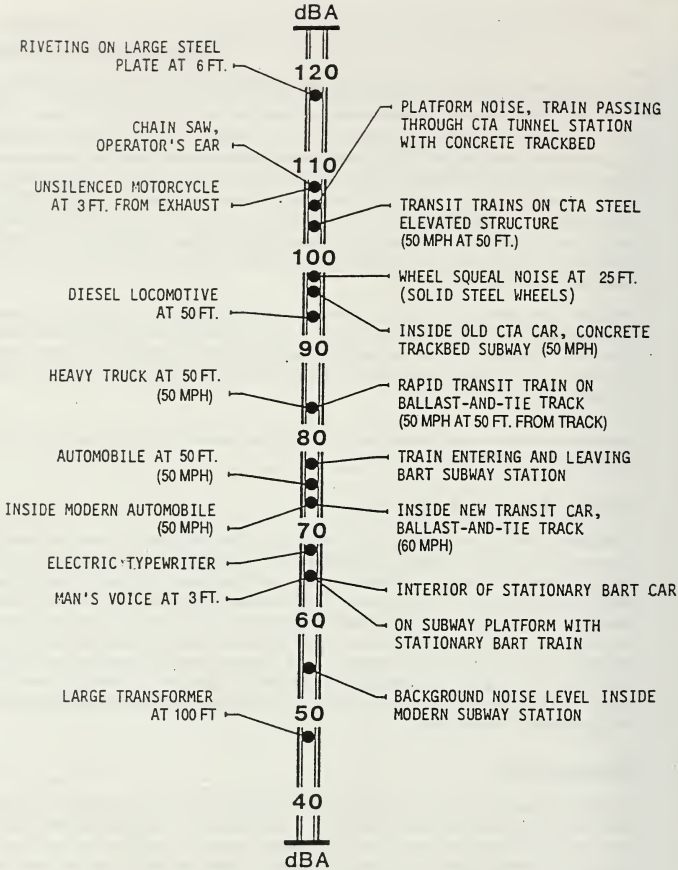
9.2 Existing Conditions

Sources of Noise and Vibration

In the project corridor, motor vehicles are a primary noise source, as is typical for urban and suburban environments. The project corridor's proximity to SFIA makes jet aircraft a major noise source as well. In South San Francisco, San Bruno, Millbrae, and Burlingame, CalTrain is another major source of ambient noise. As of November 1993, 60 trains per day operate on the SPTCo tracks through this area, enroute from the San Francisco terminus station at Fourth and Townsend Streets to San Jose, with the majority running during commute hours. Areas of South San Francisco and San Bruno are exposed to noise from traffic on I-380. The communities in the project corridor close to SFIA and the SPTCo tracks are exposed to relatively high levels of ambient noise. The communities further away from these two noise sources have ambient noise environments typical of average suburban residential areas.

Measurement Sites

Twenty-four measurement sites were chosen in order to characterize the ambient noise and vibration levels within the project corridor (Table 3.9-1). The measurement sites were selected based on proximity to noise-sensitive land uses and projected impacts, in order to achieve thorough geographical coverage of the project corridor. In addition, short-term vibration measurements were made at 14 of the locations; these data characterize the ambient vibration environment.



SOURCE: Handbook of Urban Rail Noise and Vibration Control, U.S. Department of Transportation, Urban Mass Transit Administration, 1982
(Converted to English Units)

OGDEN

Typical Noise Levels

FIGURE 3.9-1

Table 3.9-1
Existing Levels of Environmental Noise and Vibration

		Airborne Noise				Ground Vibration[2]
Site No.	Closest Receptor	L_{eq} (peak hour) (dBA)	L_{50} (dBA)	L_{dn} (dBA)	Criteria Area Category[1]	L_{I} (dB)
1	Italian Cemetery	61-62	55-56 day 38-48 night	57-58	II	47-52
2	Home of Peace Cemetery	63	58 day N/A night	58-59[3]	II	52-55
3	Treasure Island Trailer Court[R]	61-63	45-52 day 36-46 night	57-59	II	37-49
4	Kaiser Medical Center[R/C]	62-65	57-60 day 49-54 night	65-66	III	48-54
5	152 B Street[R/C]	56-59	N/A	62	III	41-46
6	Los Cerritos Elementary School	57-59	50-53 day 45-48 night	62	III	35-46
7	San Francisco High School	67-68	48-56 day 40-51 night	68-69	III	41-46
8	Summerfield Suites Hotel	70-72	64-69 day 62-67 night	70	V	47-58
9	1082 Huntington Avenue[R/C]	65-68	55-58 day 50-57 night	72-73	V	N/A
10	180 Diamond Street[R]	73-77	51-59 day 44-55 night	71	V	N/A

Table 3.9-1 (continued)
Existing Levels of Environmental Noise and Vibration

Site No.	Closest Receptor	Airborne Noise: L_{eq} (peak hour) (dBA)	Airborne Noise: L_{50} (dBA)	Airborne Noise: L_{dn} (dBA)	Criteria Area Category[1]	Ground Vibration[2]: L_1 (dB)
11	San Bruno Church of God[(R)]	68-71	61-65 day 48-56 night	70-72	V	N/A
12	Homes on 6th off San Bruno Ave[(R)]	73-76	61-65 day 48-61 night	72	IV	52-62
13	First National Bank	68-69	62-63 day 48-54 night	68-70	V	N/A
14	796 2nd Avenue[(R)]	70-74	58-62 day 48-56 night	69-71	V	N/A
15	Seventh Avenue Park[(R)]	71-73	54-58 day 48-56 night	69-71	V	N/A
16	540 First Avenue[(R)]	70-72	52-58 day 40-52 night	69-71	V	N/A
17	397 Huntington Avenue[(R)]	68-70	60-63 day 54-60 night	69-70	V	56-66
18	256 San Luis[(R)]	65-69	56-60 day 56-60 night	68-69	V	48-55 57-60[(4)]
19	Lomita Elementary School; Homes on San Antonio[(R)]	65-68	54-60 day 49-58 night	67-68	III, V	44-67 60-62[(4)]
20	Homes at corner of Madrone Street and Bay Street[(R)]	62-65	59-63 day 50-58 night	66-68	V	N/A
21	Homes on San Rey & Santa Paula at Monterey	63-68	51-60 day 45-53 night	65-67	III	N/A

Table 3.9-1 (continued)
Existing Levels of Environmental Noise and Vibration

		Airborne Noise				Ground Vibration[2]
Site No.	Closest Receptor	L_{eq} (peak hour) (dBA)	L_{50} (dBA)	L_{dn} (dBA)	Criteria Area Category[1]	L_1 (dB)
22	331 Aviador[R]	67-70	52-58 day 43-53 night	67-69	III	N/A
23	Care West Burlingame[R]	69-70	63-66 day 56-62 night	69-74	III, IV	N/A
24	Meadowbrook Trailer Park[R]	71-73[5]	57-67 day 49-62[5] night	67[5]	II, III	N/A

Source: Wilson, Ihrig & Associates, Inc.

Notes: Measured in December 1990, August 1991, October 1993, and May 1994 at locations along the project corridor.

1) These categories and the corresponding typical noise levels are from the BART Extensions Program System Design Criteria, March 1992.

Area		L_{50}	L_{dn}
I	**Low Density** urban residential, open space park, suburban residential, or quiet recreation area. No nearby highways or boulevards.	40-50/day 35-45/night	Below 55
II	**Average** urban residential, quiet apartments and hotels, open space, suburban residential, or occupied outdoor areas near busy streets.	40-50/day 35-45/night	50-60
III	**High Density** urban residential, average semi-residential/commercial areas, parks, museum, and non-commercial public building areas.	50-60/day 45-55/night	55-65
IV	**Commercial** areas with office buildings, retail stores, etc. primarily daytime occupancy. Central Business Districts.	60-70	Over 60
V	**Industrial** areas or **Freeway and Highway Corridors.**	Over 60	Over 65

2) Based on 10-minute sample.
3) Estimated from short-term data.
4) Maximum vibration levels based on measurements of CalTrain passbys.
5) Daytime levels influenced by construction of the Colma Station.

L_{50} Level exceeded 50% of the time.

L_{eq} An average of levels (energy equivalent) at a location over time. (Peak hour) = The highest L_{eq} during the survey.

L_{dn} A measure of day/night levels, L_{dn} is an extension of the L_{eq} of noise levels over a 24-hour period, but places greater emphasis on nighttime hours when people are typically at home. Noise levels between 10 P.M. and 7 A.M. are weighted to account for the greater intrusiveness of noise during nighttime hours.

L_1 Level exceeded 1% of the time (infrequent at peak).

N/A Not available.

R Residential area.

R/C Residential/Commercial area.

Vibration levels for portions of the project corridor, or at a distance removed from motor vehicle traffic, ranged from an L_1 (which corresponds to infrequently occurring peaks) of 35 dB to a high of 52 dB. Closer to traffic, the L_1 of the ambient vibration velocity level ranged from 54 dB to 66 dB. These levels indicate that the existing groundborne vibration levels are probably below the threshold of perception (65 to 70 dB) throughout the project corridor. In general, the measured vibration levels are just below the threshold of perception in areas with heavily traveled streets and reflect the presence of trucks and trains.

9.3 Impact Assessment and Mitigation

Significance Criteria and Methodology

Significance Criteria

Two types of criteria apply to transit noise evaluation. "Absolute criteria," as developed by the American Public Transit Association (APTA), are based on the average maximum passby noise level of a single transit train, measured at a noise-sensitive receptor. The second criterion, the "relative criteria," is based on the change in the "noise exposure." Noise exposure refers to the effects of noise over time and is used here to assess both project-specific and cumulative impacts. Guidelines for the use of relative criteria are given by the FTA, formerly the UMTA, in the UMTA Circular C5620.1.

Absolute Noise Criteria. The airborne noise criteria apply to exterior noise levels, whereas groundborne noise levels apply indoors. These criteria have been adopted by BART in its *Extensions Program System Design Criteria.* Table 3.9-2 presents the BART maximum passby noise level criteria used in the impact analysis. These criteria relate directly to the community categories defined in Table 3.9-1.

Groundborne noise criteria for project-specific impacts are indicated in Table 3.9-3 and are relevant only for subway segments.

The noise significance criteria are based on the type of receptor (e.g., single family residence) and the Community Area Category in which the receptor lies. The Community Area Category for a sensitive receptor is determined based on the surrounding land use (e.g., high density residential or mixed commercial/residential) and the existing ambient noise environment. Some significance criteria are independent of the Community Area Category, and are based solely on the type of receptor (e.g., schools) and other special-function categories listed in the bottom half of Table 3.9-2.

Absolute Vibration Criteria. Vibration criteria used in this FEIR/FEIS are from the *BART Extensions Program Systems Design Criteria,* which is based on generally accepted vibration standards. Table 3.9-4 below presents criteria for evaluating the impact of groundborne vibration of floor surfaces within a building. Groundborne vibration less than or equal to the criteria may be perceptible, but the level would be sufficiently low so that no significant intrusion or annoyance should occur. If the predicted groundborne noise and vibration levels exceed the BART criteria, a significant impact is indicated and mitigation measures are identified.

Table 3.9-2
Criteria for Maximum Airborne Noise from Transit Train Operations

Residences and Commercial Buildings		Maximum Passby Noise Levels (dBA)		
Community Area Category		Single Family Dwellings	Multi-family Buildings	Commercial Buildings
I	Low Density Residential	70	75	80
II	Average Residential	75	75	80
III	High Density Residential	75	80	85
IV	Commercial	80	80	85
V	Industrial/Highway	80	85	85

Special-Function Buildings and Outdoor Areas

Building or Occupancy Type	Maximum Passby Noise Levels (dBA)
Amphitheaters	65
"Quiet" Outdoor Recreation Areas	70
Concert Halls, Radio and TV Studios	70
Churches, Theaters, Schools, Hospitals, Libraries	75

Source: BART Extensions Program System Design Criteria, March 1992.

Note: Mausoleums are in the same category as churches.

Absolute Ancillary Facilities Criteria. Two types of airborne noise from ancillary facilities, transient and continuous, would occur with construction of the Aerial Design Option LPA. Transient noise occurs during train passbys and this noise is transmitted from vent shaft openings. Traction power substations and fan noise is characterized as continuous ancillary equipment noise. The acceptable levels of transient and continuous noises are different. Transient noises are acceptable at higher levels than continuous noises, particularly continuous noises containing pure tones. Table 3.9-5 presents noise criteria for ancillary facilities (e.g., vent shafts, power substations, etc.) in each of community area categories. Ancillary facility noise in excess of the criteria would result in a significant impact.

Relative Criteria. "Relative criteria" are based on the change in the "noise exposure" (i.e., energy-averaged noise level over time) and are applied to the project-specific and cumulative analysis, which addresses noise changes for all foreseeable projects affecting the project corridor. FTA guidelines apply to the relative change in long-term airborne noise, expressed by the energy equivalent of noise levels over a 24-hour period (L_{eq}). Where there is nighttime occupancy (e.g., residential areas) and the transit system operates during this time, the L_{dn} is used instead of the L_{eq} to evaluate noise exposure impact. A measure of day/night levels, L_{dn} is an extension of the L_{eq} in which greater emphasis is placed on nighttime hours when people are typically home by adding 5 decibels to noise levels between 10 P.M. and 7 A.M. If the increase in the peak-hour L_{eq} or L_{dn} is over 3 dBA at noise-sensitive locations, project-specific and cumulative noise impacts are significant under the FTA

Table 3.9-3 Criteria for Maximum Groundborne Noise from Transit Train Operations[1]			
Residences and Buildings with Sleeping Areas	Maximum Passby Noise Levels (dBA)		
Community Area Category	Single Family Dwellings	Multi-family Buildings	Hotel/Motel
I Low Density Residential	30	35	40
II Average Residential	35	40	45
III High Density Residential	35	40	45
IV Commercial	40	45	45
V Industrial/Highway	40	45	50

Special-Function Buildings and Outdoor Areas

Building or Occupancy Type	Maximum Passby Noise Levels (dBA)
Concert Halls and TV Studios	25
Auditoriums and Music Rooms	30
Churches and Theaters	30–35
Hospital Sleeping Rooms	35–40
Courtrooms	35
Schools and Libraries	35–40
University Buildings	35–40
Offices	35–45
Commercial Buildings	45–55

Source: BART Extensions Program System Design Criteria, March 1992.
Notes: Mausoleums are in the same category as Churches. Hospital diagnostic facilities are generally in the same category as Research Laboratory.
1) Criteria apply to the vertical vibration of floor surfaces within the buildings.

guidelines. Although project-specific impacts at commercial and industrial areas are addressed, these uses are not considered noise-sensitive and, therefore, the cumulative impact at these receptors has not been analyzed in the determination of significance.

The cities of Colma, South San Francisco, San Bruno, Millbrae, and Burlingame and the County of San Mateo have noise guidelines contained in the Noise Element of each jurisdiction's general plan.

Table 3.9-4
Criteria for Maximum Groundborne Vibration from Transit Train Operations(1)

Residences and Buildings with Sleeping Areas		Groundborne Vibration Maximum Passby Velocity Level (dB re 10^{-6} in/sec)		
Community Area Category		Single Family Dwellings	Multi-family Buildings	Hotel/Motel
I	Low Density Residential	70	70	70
II	Average Residential	70	70	75
III	High Density Residential	70	75	75
IV	Commercial	70	75	75
V	Industrial/Highway	75	75	75

Special-Function Buildings

Building or Occupancy Type	Maximum Passby Vibration Levels (dB) (dB re 10^{-6})
Concert Halls and TV Studios	65
Auditoriums and Music Rooms	70
Churches and Theaters	70-75
Hospital Sleeping Rooms	70-75
Courtrooms	75
Schools and Libraries	75
University Buildings	75-80
Offices	75-80
Commercial and Industrial Buildings	75-85
Vibration Sensitive Industrial or Research Laboratories	60-70

Source: BART Extensions Program System Design Criteria, March 1992.

Note: Mausoleums are in the same category as churches. Hospital diagnostic facilities are generally in the same category as research laboratories.

1) Criteria apply to the vertical vibration of floor surfaces within the buildings.

Table 3.9-5
Design Criteria for Noise From Transit System Ancillary Facilities

Community Area Category		Maximum Noise Level, dBA	
		Transient	Continuous
I	Low Density Residential	50	40
II	Average Residential	55	45
III	High Density Residential	60	50
IV	Commercial	65	55
V	Industrial/Highway	75	65

Source: BART Extension Program System Design Criteria, March 1992.

Notes: 5 dBA penalty is applied to noises with tonal components (e.g., criteria is less).
The criteria in this table shall be applied at a distance of 50 ft from the shaft outlet or other ancillary facility or shall be applied at the setback line of the nearest building or occupied area, whichever is closer.

These guidelines are the local community standards which have been adopted to reduce the effects of noise on current and future inhabitants and are used to assess cumulative noise impacts.

The Noise Elements contain numerical guidelines used by planning departments to judge the compatibility of proposed building developments with the existing noise environment and, as necessary, require some actions for the proposed development, depending on whether the land use in a given noise environment is "normally acceptable," "conditionally satisfactory," "generally unsatisfactory," or "normally unacceptable." Although there are no quantitative noise levels in the Noise Elements for new noise sources such as rapid transit systems, highways, or airports, BART airborne noise criteria result in noise levels that are consistent with the Noise Element goals of encouraging noise environment compatibility with the different kinds of land use (e.g., residential, school, hospital) encountered in the project corridor. Therefore, the Noise Element standards for noise level exposure are not used as significance criteria, but they are addressed under the cumulative analysis for comparative purposes.

Methodology. Noise and vibration levels for potential receptors in the project corridor were calculated using standard models (US DOT, UMTA, 1982), available noise and vibration source data for the existing BART system, expected operation schedule for the BART–San Francisco Airport Extension, vibration propagation characteristics for surrounding soil strata estimated from available soil boring data for the project corridor, and conceptual drawings of plans and profiles for the Aerial Design Option LPA, including operational train speeds based on civil speed limits and station locations. Noise and vibration levels have been determined for specific receptors or groups of like receptors with an anticipated similar level of impact.

The airborne noise levels predicted for BART train operations are in some instances slightly conservative (i.e., higher than actual), because noise shielding by intervening terrain and buildings are not accounted for in the analysis and operational speeds will be somewhat lower than the civil

limits in some areas of the alignment. Where it is obvious that noise shielding would have a substantial effect on the train noise levels at specific receptors (e.g., in cemetery areas north of the bluff overlooking El Camino Real), this factor has been included in the analysis. More detailed calculations of airborne noise will be performed for the entire length of the final planned BART extension alignment prior to issuance of contracts for the design/build contractors.

The groundborne noise and vibration levels predicted for BART train operations are based on the best available data. The analysis is based on empirical models, using data from the existing BART system, with appropriate adjustments for anticipated local soil conditions. The analysis attempts to conservatively estimate the expected groundborne noise and vibration levels inside potentially affected receptors.

For subway operations, where the airborne component of noise is nonexistent, groundborne noise may be perceived as a low-pitched rumbling noise radiating inside the building structure. Therefore, groundborne noise is projected only along subway sections.

Certain assumptions (e.g., type of transit vehicle and speed) have been made regarding the ALRS (the design of which is to be performed by the SFIA), which will contribute to the future noise levels. Little about the specific design of the vehicle and track system is available at this time. For this reason, the impact analysis evaluates two likely types of vehicles, a rubber-tired vehicle and a steel-wheeled vehicle. Likewise, for the Highway 101 connector ramps, certain assumptions regarding vehicle speed and volume have been made.

The noise and vibration level predictions and effectiveness of potential mitigation are sufficiently accurate for the purposes of an environmental analysis. However, final noise and vibration predictions and specific details of noise and vibration mitigation measures (e.g., exact height, location and extent of sound wall, or specific type of vibration reduction measure) will be determined before issuance of a notice to proceed to the project's design/build contractors. In particular, further refinements of groundborne noise and vibration levels will include field measurements of vibration characteristics of the types of soils and geologic strata found in the project corridor. Mitigation measures will be selected as a result of these tests during the final stages of engineering. Although the mitigation measures recommended are intended to achieve noise and vibration compliance, other measures could be implemented to achieve equivalent mitigation. Table 3.9-6 presents a summary of the number of sensitive receptors impacted within each city by the Aerial Design Option LPA.

Project-Specific Analysis

Colma

1. *The proposed wheel truing machine, included as part of the Daly City Shop/Yard redesign, would generate possible airborne noise impacts to 60 to 77 homes in the Meadowbrook Trailer Park. (S)*

   A proposed wheel-truing machine and turntable included as part of the Daly City Shop/Yard redesign would generate possible airborne noise impacts to 60 to 77 homes in the Meadowbrook Trailer Park. Based on preliminary information, the wheel-truing machine is

Table 3.9-6
Summary of Noise and Vibration Impacts to Sensitive Receptors

	Number of Sensitive Receptors
Colma*	
Groundborne Noise	4-5
Airborne Noise	NA
Vibration	7-8
South San Francisco	
Groundborne Noise	39-43
Airborne Noise	0
Vibration	90-100
San Bruno	
Groundborne Noise	2
Airborne Noise	49-59
Vibration	19-23
Millbrae	
Groundborne Noise	17-23
Airborne Noise	10-13
Vibration	28-37
Burlingame	
Groundborne Noise	0
Airborne Noise	0
Vibration	0

* Excluding the Meadowbrook Trailer Park.

projected to generate an acceptable noise level of 52 dBA at the nearest residential property line. (The APTA categories II and III apply to this area. The more restrictive APTA category II of 55 dBA applies in this case. However, this projection is not based on the actual machine BART intends to use; BART is proposing to use a new machine for which operational data are unavailable. Consequently, the wheel-truing machine may generate noise levels in excess of the 55 dBA criterion.

MITIGATION MEASURES. Implementation of Mitigation Measure 1.1 will reduce noise levels to an insignificant level. Mitigation Measures 1.2, 1.3, and 1.4 may be considered optional for further noise reduction. The selection of the appropriate technique and mitigation details will

be made prior to issuance of a notice to proceed to the design/build contractor and the start of the final design phase of the design/build contract.

1.1 *Building Enclosure and Design.* BART will design the maintenance building that houses the wheel-truing machine with no openings facing residences. This includes, but is not limited to, access doors for the vehicles and employees, ventilation gratings, and windows. The ventilation ducts and vents will be acoustically treated to eliminate the transmission of noise to the exterior of the building. The use of sound-absorbing material in the pit and on the building structure will reduce the level of noise within, and transmitted through, the building.

1.2 *Shielding of the Wheel Truing Machine.* Noise shields around components of the wheel truing machine will be constructed if it is determined, during the preliminary engineering phases of the project, that Mitigation Measure 1.1 is insufficient to meet the standards in Table 3.9-5.

1.3 *Sound Barriers at Vehicle Access/Egress Doors.* BART will use transparent vinyl, strip curtains, or equivalent measures at the vehicle access/egress doors to reduce the noise levels transmitted through these openings if it is determined, during the preliminary engineering phases of the project,that Mitigation Measure 1.1 is insufficient to meet the standards in Table 3.9-5.

1.4 *At-Grade Sound Wall.* BART will construct an 8-foot to 12-foot-high landscaped sound wall, or equivalent measure, at the southern property line of the Daly City Shop/Yard near the Meadowbrook Trailer Park if it is determined, during the preliminary engineering phases of the project, that Mitigation Measure 1.1 is insufficient to meet the standards in Table 3.9-5. If this measure is used, it may be designed to be independent of, or designed in combination with, the wall proposed under Mitigation Measure 2.1. The sound wall may create a visual impact on the trailer park residents. Whenever sound walls are recommended, BART should design them to be visually interesting, through landscaping and use of techniques such as articulation, color, and texture.

2. *The proposed turntable at the Daly City Shop/Yard would generate airborne noise impacts for 60 to 77 homes in the Meadowbrook Trailer Park. (S)*

The proposed turntable with no mitigation would generate a noise level of approximately 61 dBA at the nearest residential property line. An additional 5 dBA penalty for the tonal nature of the noise would result in an effective noise level of 66 dBA. The turntable noise characteristically would last for two to three minutes at a time, and would generally be used during the evening/nighttime hours as trains are prepared for morning rush operation. This noise level would be in excess of the BART criterion for transient noise of 55 dBA and would cause a significant impact. The current Daly City Shop/Yard redesign already includes a sound wall to shield the homes in the Meadowbrook Trailer Park from the turntable. This 8-foot to 12-foot-high sound wall surrounding the turntable would reduce the noise level at the nearest residences to a maximum noise level of 58 dBA, which would still be a significant impact (including the 5 dBA tonal penalty, see Table 3.9-5).

MITIGATION MEASURES. Implementation of either of the following mitigation measures would reduce this impact to an insignificant level.

2.1 *At-Grade Sound Wall.* BART will erect an 8-foot to 12-foot-high landscaped sound wall, or implement an equivalent measure, between the turntable and the nearby residences. This sound wall or its equivalent should be located as close as possible to the turntable. The exact location and height of this wall will be selected prior to issuance of a notice to proceed to the design/build contractor. A potential impact of the sound wall is its visual impact on the trailer park residents. Whenever sound walls are recommended, BART will design them to be visually appealing, through landscaping and use of techniques such as articulation, color, and texture.

2.2 *Redesign of the Turntable.* As an option to Mitigation Measure 2.1, BART will design the turntable to minimize the noise impacts from the Daly City Shop/Yard. This redesign could entail implementing a different form of suspension so that the operation noise levels satisfy BART design criteria. If BART determines during the preliminary engineering phase that this measure is more cost-effective and would attain the design criteria, this design measure will replace Mitigation Measure 2.1.

3. *The new car wash facility in the Daly City Yard would generate noise levels less than the criterion at the nearest homes in the Meadowbrook Trailer Park. (I)*

4. *The Aerial Design Option LPA would result in groundborne noise impacts at four to five sensitive receptors and vibration impacts at seven to eight sensitive receptors in Colma. (S)*

The operational groundborne vibration levels for the proposed project would be of such a low level that there would be no possibility for structural damage due to the vibration transmitted to buildings near the alignment. The major impact is the potential for annoyance caused by the perception of vibration in nearby buildings. BART operations would generate groundborne vibration levels up to 1 dB in excess of the 70 dB criterion at a mausoleum and the chapel/office in the Salem Memorial cemetery, and 4 dB in excess at a mausoleum at the Hills of Eternity cemetery. These structures would be within 40 feet of the alignment.

An office building (Holy Cross), three other offices, and a residential building on Mission Road in the Triangle neighborhood would be located 25 feet from the alignment (track centerline) and would experience groundborne noise and vibration levels in excess of the criterion level. The groundborne vibration levels are expected to be 6 to 7 dB over the 75 dB criterion; the groundborne noise levels would be up to 6 dBA over the 40 dBA criterion for offices and up to 13 dBA over the 35 dBA criterion for residential building. The affected areas requiring mitigation are illustrated in Figure 3.9-2.

MITIGATION MEASURES. Implementation of the following measures in the locations identified would reduce the impacts to an insignificant level. Mitigation Measure 4.1 is the most effective approach, but Mitigation Measures 4.2, 4.3, or 4.4 will be used as an alternative control measure where less groundborne noise and/or vibration control is required. The method of mitigation for groundborne noise or vibration will be selected prior to issuance of a notice to proceed to the design/build contractor and the start of the final design phase of the design/build contract.

4.1 *Floating Slab Trackbed.* BART will comply with its design criteria through construction of a floating slab trackbed to minimize the groundborne noise and vibration levels at structures on Mission Road. A floating slab track support system is an effective means

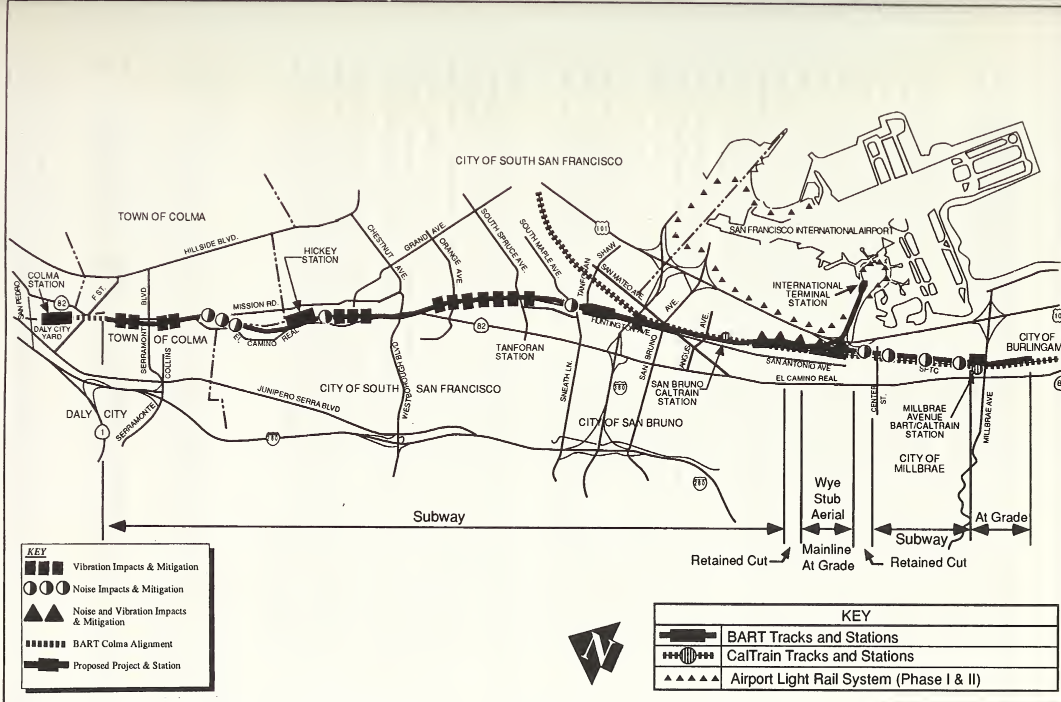


FIGURE 3.9-2

Location of Noise and Vibration Impacts and Mitigation Measures

of groundborne noise and vibration control. The floating slab system consists of a mass (concrete slab), resilient support elements (rubber pads) which act as springs and dampers, and a rigid support (concrete invert) for the springs.

4.2 *Resiliently Supported Ties or Soft Rail Fasteners.* BART will use resiliently supported ties, soft rail fasteners, or other mitigation measures achieving equivalent vibration reduction to reduce the groundborne vibration levels at the mausoleum/memorial structures. When vibration mitigation is required to reduce groundborne vibration levels by 3 dB or less, or groundborne noise levels 6 dBA or less, resiliently supported ties (e.g., RS-Stedef, LVT/Permanent Way, or Nucor systems) will be used to mitigate groundborne noise and vibration. Instead of a resiliently supported concrete slab, the resilient tie systems use concrete rail ties supported in rubber boots to achieve vibration isolation, thereby reducing groundborne noise and vibration transmitted to adjacent buildings. The resiliently supported tie systems are essentially standard designs and therefore cannot be varied significantly to accommodate the requirements of each different situation. For this and other reasons, the resiliently supported ties are not as effective a control measure as a floating slab system. Based on the current analysis, this method, however, would be adequate in the cemetery areas of Colma and where mitigation of 3 dB or less is needed.

Soft rail fasteners (e.g., the Köln Egg) are another means of groundborne noise and vibration mitigation. This system uses a resilient material in the rail fastener to isolate the vibration generated by the transit vehicle. A special design of the Köln Egg has been used on crossovers and turnouts.

4.3 *Offsite Mitigation.* As an alternative to a floating slab trackbed, resilient ties, or soft rail fasteners, BART will use an offsite mitigation measure providing equivalent mitigation, such as isolation of a building at its points of contact to the ground, or isolation of sensitive equipment from the floor. Isolating a building would entail raising the building off its foundations and placing a neoprene pad at the points where the building rests on its foundations. Isolating a piece of equipment may entail use of a vibration isolator table, isolation of the slab floor, or use of springs and/or pads under the equipment legs.

4.4 *Lowering Track Profile.* As an alternative to a floating slab trackbed, BART may determine prior to the completion of all preliminary engineering that lowering the track profile, in conjunction with Mitigation Measure 4.2, resilient ties, or 4.3, i.e., offsite mitigation or other effective measures, may be sufficient to reduce these impacts to an insignificant level.

South San Francisco

5. *The LPA would result in groundborne noise impacts to 39 to 43 sensitive receptors, and vibration impacts to 90 to 100 sensitive receptors in South San Francisco (see Figure 3.9-2). (S)*

BART trains would generate passby groundborne noise levels 2 to 10 dBA in excess of the 40 dBA criterion and vibration levels 2 to 8 dB in excess of the 75 dB criterion at 34 to 38

homes in the Treasure Island Trailer Court. These homes are located approximately 20 to 25 feet from the alignment.

BART trains would also generate groundborne vibration levels 2 dB in excess of the 70 dB criterion at two residences on Mission Road near Sequoia Avenue, and 1 dB in excess at two multi-family residences on Mission Road near Holly Avenue. Two residential buildings on Mission Road which would experience groundborne vibration levels in excess of the criterion would be demolished for the Hickey Station. Groundborne vibration levels would be 1 to 4 dB in excess of the 75 dB criterion at five office buildings on Mission Road. Four of these office buildings would also experience groundborne noise 1 to 4 dBA above the established criterion. The 60 dB groundborne vibration criterion being applied to the Kaiser Medical Center, located 125 feet from the alignment, would be exceeded by 9 dB. Further investigation during the preliminary engineering phase of the BART extension may determine a different level of vibration from BART operations, and the use of more specific criteria at the Kaiser Medical Center may indicate a different level of impact.

Between Chestnut and South Spruce Avenues east of the proposed alignment, several residences would experience groundborne vibration levels in excess of the appropriate criterion: one multi-family residence on Memorial Avenue in the Orange Park area (by 1 dB), one single family residence on Orange Avenue (by 7 dB), and 29 to 33 single family residences on Myrtle Avenue in the Mayfair neighborhood (by 4 to 7 dB). On the west side of the proposed alignment within 65 to 125 feet of the alignment, one single family residence on 2nd Street, four single family residences on C Street, one church on West Orange Avenue, and nine to 11 single family residences on Francisco Drive, would experience groundborne vibration levels 1 to 3 dB in excess of the 70 dB criterion.

Groundborne noise levels at one single family residence on Orange Avenue would also experience groundborne noise levels 2 dBA above the 35 dBA criterion.

MITIGATION MEASURES. Implementation of either Mitigation Measure 4.1, 4.2, 4.3, i.e., floating slab trackbed, resiliently supported ties, offsite mitigation, would reduce groundborne vibration and groundborne noise levels at the homes and offices in the Sunshine Gardens neighborhood, at the Kaiser Medical Center, and at the homes in the Mayfair neighborhood to an insignificant level. One of these measures would be implemented to reduce impacts to homes and offices on Mission Road, homes in the Orange Park and the Town of Baden neighborhoods, and homes on Francisco Drive along the subway segment of the alignment. A determination to use this technique or another measure providing effective groundborne noise and vibration reduction will be made prior to issuance of a notice to proceed to the design/build contractor.

San Bruno

6. *The Aerial Design Option LPA would result in groundborne vibration impacts at a hotel, 18 to 20 residences, and a church on Huntington Avenue in San Bruno. The hotel and church would also experience groundborne noise impacts. (S)*

The groundborne noise and vibration levels would be 9 dBA and 5 dB above the respective criteria for the hotel. At the residences, the vibration would be 1 dB above the criterion. The

church would experience groundborne noise and vibration 1 dBA and 2 dB above the respective criteria.

MITIGATION MEASURES. Implementation of either Mitigation Measure 4.1, 4.2, 4.3, i.e., floating slab trackbed, resiliently supported ties, offsite mitigation, would reduce groundborne noise and vibration to an insignificant level.

7. *Airborne noise from the at-grade segment of the Aerial Design Option LPA would significantly affect San Bruno residents. (S)*

Potential airborne noise would impact 49 to 59 sensitive receptors along Huntington and San Antonio Avenues due to BART operation on mainline track. The BART alignment in this area of San Bruno would be at-grade.

MITIGATION MEASURES. Implementation of the following mitigation measure would reduce this impact to an insignificant level.

7.1 *Sound Barrier Wall.* BART will comply with its design criterion through construction of a masonry wall, or other similarly dense material, to mitigate noise impacts. The sound wall would be located between the CalTrain and BART tracks on top of the crash barrier (approximately 9 to 10 feet from the centerline of the BART tracks). The total height of the sound wall above the top of the BART tracks would be 8 to 10 feet including the crash barrier. The sound wall would mitigate noise impacts to both the first and second stories of the residences along Huntington and San Antonio Avenues.

Millbrae

8. *Lomita Park Elementary School in Millbrae would experience airborne noise impacts. (S)*

Potential airborne noise impacts to schools near the mainline are based on exposure to train passby noise exceeding a significance criterion of 75 dBA. The BART mainline alignment through this portion of Millbrae would run at grade. A sound wall would be constructed west of BART, thereby reducing the noise from BART trains. This wall would be placed on top of the crash barrier, located between BART and CalTrain. The wall would be 8 to 10 feet above the surface of the BART tracks and 4 to 10 feet from the BART tracks.

MITIGATION MEASURE. Mitigation Measure 7.1 above, i.e., sound barrier wall, applies to this impact and would reduce it to an insignificant level.

9. *Ten to twelve homes in the Airport Park neighborhood in Millbrae would experience significant airborne noise impacts. (S)*

Potential airborne noise impacts to single family residences near the BART mainline service are based on exposure to train passbys exceeding a significance criterion of 75 dBA. The BART alignment passes the Airport Park neighborhood at grade. A sound wall would be constructed, thereby providing some noise attenuation for the 10 to 12 homes along Landing Lane that would be affected by BART trains.

MITIGATION MEASURES. Implementation of Mitigation Measure 7.1 above, i.e., sound barrier wall, would reduce airborne noise impacts for homes on Landing Lane to an insignificant level. The height of this barrier would be 8 to 10 feet.

10. *Homes in the Airport Park neighborhood in Millbrae would experience significant groundborne vibration impacts. (S)*

Potential groundborne vibration impacts to single family residences near the BART mainline service are based on exposure to train passbys exceeding a significance criterion of 70 dB. Because of the proximity of the alignment, groundborne vibration levels would be up to 1 dB in excess of the criterion at 10 to 12 homes in the Airport Park neighborhood.

MITIGATION MEASURES. Implementation of either Mitigation Measures 4.2 or 4.3, i.e., resiliently supported ties or soft rail fasteners or offsite mitigation, individually, would reduce the identified groundborne vibration impact to an insignificant level.

11. *Homes in Millbrae near crossovers would experience groundborne noise and vibration impacts. (S)*

Potential groundborne vibration impacts to single family residences near the BART mainline service are based on exposure to train passbys exceeding a significance criterion of 75 dB; for groundborne noise, the applicable standard is 35 dBA. The Aerial Design Option LPA would pass the Marino Vista, North Millbrae, Millbrae Manor, and Bayside Manor neighborhoods of Millbrae in cut-and-cover subway.

Because of the proximity to proposed crossovers, a total of 14 to 17 homes would experience groundborne vibration levels in excess of the 75 dB criterion. Five to seven homes adjacent to Monterey Street, between Cedar Street and San Rey Avenue in the Marino Vista neighborhood, would experience groundborne vibration levels up to 6 dB in excess of the criterion. Groundborne noise levels at residences in the Marino Vista neighborhood would be up to 3 dBA in excess of the noise criterion. Fifteen to 19 homes on Aviador Avenue in the Bayside Manor neighborhood would experience groundborne vibration levels up to 10 dB in excess of the criterion. Twelve to 16 of the homes on Aviador Avenue would also experience groundborne noise levels up to 10 dBA in excess of the 35 dBA criterion.

MITIGATION MEASURES. Mitigation Measure 4.2, i.e., resiliently supported ties or soft rail fasteners, or Mitigation Measure 4.3, i.e., offsite mitigation or other effective measure, would reduce significant groundborne vibration and noise impacts at the homes in the Marino Vista neighborhood to an insignificant level. Mitigation Measure 4.1, i.e., floating slab trackbed, floating slab trackbed in combination with a special crossover box structure or Mitigation Measure 4.3, i.e., offsite mitigation or other effective measure, would reduce these same impacts at homes in the Bayside Manor neighborhood to an insignificant level. Selection of the appropriate technique will be determined prior to the issuance of the notice to proceed to the design/build contractor.

Burlingame

12. *Operation of BART vehicles on the tailtracks in Burlingame would generate airborne noise levels below the applicable significance criterion. (I)*

    Potential airborne noise impacts to new multi-family residences and a senior care facility near the tailtracks in Burlingame are evaluated based on exposure to train noise exceeding a significance criterion of 75 dBA. The at-grade BART tailtracks are proposed parallel to and east of the CalTrain alignment. Nearby sensitive receptors include a recently approved condominium project and a senior health care facility, both south of the Burlingame Police Department along California Drive. The slow operating speeds (25 mph or less) and distance from these land uses would result in noise levels below the 75 dBA criterion.

Aerial Wye-Stub to the SFIA

13. *BART operations on the aerial guideways would create airborne noise impacts for homes in San Bruno. (S)*

    Potential airborne noise impacts to single family residences near BART service are based on exposure to train passbys exceeding a significance criterion of 75 dBA. Forty-nine to 59 homes on San Antonio Avenue in the Lomita Park neighborhood would experience noise impacts from the aerial structure in addition to the noise impact indicated above under Impact 7. Only two homes on Huntington Avenue, near the subway portal, would experience noise impacts from BART operations on the aerial guideway only. Noise levels would be up to 5 dBA in excess of the residential criterion for airborne noise.

    MITIGATION MEASURES. Implementation of the following mitigation measure would reduce this impact to an insignificant level. Selection of the appropriate technique and design details will be made prior to issuance of a notice to proceed to the design/build contractor.

    13.1 *Aerial Structure Sound Barrier Wall with Absorption.* BART will comply with its design criteria through construction of an aerial structure sound wall with absorption, or other measures achieving equivalent noise mitigation, to reduce the noise levels to the impacted homes. The sound wall will be the standard BART aerial structure wall.

14. *The Lomita Park Elementary School in Millbrae would be exposed to significant airborne noise. (S)*

    Potential airborne noise impacts to schools near the mainline are based on exposure to train passby noise exceeding a significance criterion of 75 dBA. The Lomita Park school would already experience noise impact from the at-grade portion of the alignment, as discussed above under Impact 9. The aerial wye-stub (southern leg) of the Aerial Design Option LPA would generate noise levels up to 2 dBA in excess of the criterion at the school's playground.

    MITIGATION MEASURES. Implementation of Mitigation Measure 13.1, i.e., aerial structure sound barrier wall, applies to this impact and would reduce it to an insignificant level.

15. *An office building at the SFIA would experience airborne noise impacts from BART operations. (S)*

The United Airlines administration building at the SFIA, approximately 60 feet from the aerial wye-stub, would experience noise levels up to 5 dBA in excess of the 80 dBA criterion because the alignment would be close to the building and a crossover is proposed in the vicinity.

MITIGATION MEASURES. Implementation of Mitigation Measure 13.1, i.e., aerial structure sound barrier wall, applies to this impact and would reduce it to an insignificant level.

16. *BART service at the Airport International Terminal would not create noise impacts in the Terminal because the operating speeds would be less than 36 miles per hour which would not result in an exceedance of the significance criterion. (I)*

Project Corridor

17. *BART ancillary facilities (i.e., substations, transformers, and emergency power generators; fans and cooling towers; and ventilation shafts) would emit noise, but this noise would not be significant due to the distance of the noise source from existing sensitive receptors and to the implementation of BART design criteria. (I)*

Cumulative Analysis

The cumulative effects are those resulting from projected future growth as well as SFIA expansion plans, the Hickey Boulevard extension, the El Camino Corridor redevelopment project, and the proposed BART extension. The rate of development is assumed to be that projected by ABAG in its *Projections '94.* Specific activities that would contribute to the ambient noise environment in the project corridor include increases in automobile usage, CalTrain service, and development at the SFIA. Each of these is discussed in turn and then assessed cumulatively with BART operations. Significant cumulative noise exposure impacts occur where the L_{dn} is projected to increase by more than 3 dBA in residential areas.

Based on an increase in local and highway traffic, there would be an increase in the noise exposure levels in the year 2010 of up to 1 dBA, compared to the noise levels in 1993, corresponding to an average change of 20 percent in traffic volumes. The exception to this increase occurs in the lower Lomita Park neighborhood, where traffic would increase more dramatically. An increase of 2 to 3 dBA is estimated for this area. When combined with BART operations, cumulative noise levels would increase by 1 dBA and from 3 to 4 dBA in certain areas. An increase over 3 dBA is a significant cumulative impact.

An increase in CalTrain service would raise the noise exposure level by 0 to 1 dBA at the areas immediately adjacent to the CalTrain alignment in San Bruno, Millbrae, and Burlingame. For the SFIA, noise contours are actually projected to shrink in most cases, resulting in lower noise exposure levels caused by aircraft flyovers. This reduction in aircraft noise is expected due to noise abatement efforts described in the SFIA Master Plan and the gradual shift to quieter aircraft required by SFIA regulations and federal law.

The sound barrier in San Bruno would reduce BART's contribution to the cumulative noise, and the resulting cumulative noise increase will remain at 3 dBA, which is the level generated by the local traffic and CalTrain volume increases.

With the minimal increase noted above, the future maximum noise exposure levels from the cumulative projects would range from L_{dn} 67 to 71 dBA in San Bruno and L_{dn} 67 to 70 dBA in Millbrae, which is conditionally satisfactory to generally unsatisfactory according to the applicable community noise elements. In Burlingame, in the industrial area, the L_{dn} would range from 68 to 73 dBA. The high end of the range would be caused by the nearby crossovers. Industrial uses are not considered noise sensitive by FTA. Along California Drive, the future cumulative noise exposure levels would range from L_{dn} 65 to 68 dBA.

The future noise exposure level with BART at SFIA (and no ALRS) would increase by 1 to 3 dBA. The 3dBA increase would be caused by the crossover near the United Airlines administration building. The ALRS at SFIA may increase the noise exposure level at the United Airlines administration building. Use of steel wheels would increase the level 1dB, and use of rubber tires would cause no increase. There would be no increase in noise levels at the International Terminal in either case. Future cumulative noise exposure levels with the ALRS and BART, taking into account the future noise contours from the SFIA Master Plan, would increase 3 or 4 dBA for the rubber tire and steel cases, respectively. Office uses are not considered sensitive uses, by FTA, and therefore these increases would not constitute a significant impact.

In noise- and vibration-sensitive areas where BART could produce perceptible groundborne noise and/or vibration, there are no other existing or foreseeable sources of perceptible groundborne noise and/or vibration that would occur frequently enough (i.e., numerous daily events) to cause significant impacts. Consequently, there would be no cumulative groundborne noise and vibration impacts.

In Colma and South San Francisco, project-related airborne noise would be generated by vent shafts, ancillary facilities, and traffic around stations. The noise levels from vent shafts and ancillary facilities would not cause an increase in the noise exposure levels, and the traffic from the stations would generate a noise increase of 0 to 3 dBA in the residential areas surrounding the stations. The cumulative noise levels in Colma and South San Francisco would increase by 1 to 3 dBA, resulting in no significant noise impact due to cumulative noise.

Section 10
Air Quality

10.1 Introduction

This section describes existing air quality conditions in the Bay Area in the context of federal and state ambient air quality standards. Federal and regional air quality regulations, plans, and policies applicable to the proposed BART extension are summarized. The potential air quality impacts associated with the proposed BART extension are compared to significance criteria established by the Bay Area Air Quality Management District (BAAQMD) and to conformity criteria established by the MTC and the U.S. Environmental Protection Agency (EPA). These comparisons are made to satisfy the requirements of CEQA and NEPA and to demonstrate project conformity to the State Implementation Plan, respectively. Air quality impacts directly related to construction activities are addressed later in Section 3.13, Construction.

10.2 Existing Conditions

Applicable Regulations, Plans, and Policies

Ambient Air Quality Standards

The main federal legislation dealing with air quality is the Clean Air Act (1970; amended in 1977 and 1990). The purpose of the Clean Air Act is to preserve air quality and to protect public health and welfare. To that end, the EPA has established National Ambient Air Quality Standards (NAAQS) for six "criteria" air pollutants: ozone (O_3); carbon monoxide (CO); nitrogen dioxide (NO_2); sulfur oxides (SO_X) measured as sulfur dioxide (SO_2); respirable particulate matter, defined as particulate matter smaller than 10 micrometers (μm) in diameter (PM_{10}); and lead (Pb). The EPA regulations dictate, in general, that ambient concentrations of the criteria pollutants in any area of the U.S. may not exceed their respective ambient air quality standards more than once per year. The California Air Resources Board has established California ambient air quality standards that are equal to or more stringent than the federal standards. The state and federal ambient air quality standards are shown in Table 3.10-1.

Bay Area Attainment Status

The 1990 Clean Air Act amendments established a hierarchy of classifications for nonattainment areas (i.e., areas that have not achieved the NAAQS) for different pollutants. The five nonattainment classifications are marginal, moderate, serious, severe, and extreme. Emissions reductions are required by federal law for nonattainment areas; requirements differ by nonattainment classification.

Ozone. In 1993, the BAAQMD submitted a request to the EPA for redesignation of the Bay Area as a federal O_3 attainment area. The EPA approved the request in May 1995, making the Bay Area the largest metropolitan area in the U.S. to have achieved this distinction. However, the Bay Area remains designated as a nonattainment area for the state O_3 standard, which is more stringent than the federal standard.

Table 3.10-1
State and Federal Ambient Air Quality Standards and Bay Area Attainment Status

		State Standard (1)		Federal Standard (2)	
Pollutant	Averaging Time	Concentration (3)	Attainment Status (4)	Concentration (3)	Attainment Status (4)
Ozone	1-hour	0.09 ppm	N	0.12 ppm	A
Carbon Monoxide	8-hour	9.0 ppm	A	9 ppm	N
	1-hour	20 ppm	A	35 ppm	A
Nitrogen Dioxide	Annual Average	none	none	0.053 ppm	A
	1-hour	0.25 ppm	A	none	none
Sulfur Dioxide	Annual Average	none	none	0.03 ppm	A
	24-hour	0.04 ppm	A	0.14 ppm	A
	1-hour	0.25 ppm	A	none	none
Particulate Matter	Annual Arithmetic Mean	none	none	50 $\mu g/m^3$	A
	Annual Geometric Mean	30 $\mu g/m^3$	N	none	none
	24-hour	50 $\mu g/m^3$	N	150 $\mu g/m^3$	U
Lead	30-day	1.5 $\mu g/m^3$	A	none	none
	Calendar Quarter	none	none	15 $\mu g/m^3$	A

Notes:

1) State standards are not to be exceeded.

2) Federal standard for ozone and federal standards based on annual averages or annual arithmetic means are not to be exceeded. All other federal standards are not to be exceeded more than once per year.

3) Concentration units are as follows: ppm = parts per million; and $\mu g/m^3$ = micrograms per cubic meter.

4) Attainment status is defined as follows: A = attainment; N = nonattainment; and U = unclassified.

Carbon Monoxide. The Bay Area is designated as an attainment area for the state CO standard. The Bay Area is currently designated as a moderate nonattainment area for the federal CO standard. However, no exceedances of the federal CO standard have been recorded since 1991, and the BAAQMD has applied for redesignation of the Bay Area as a federal CO attainment area. Until the EPA formally approves redesignation, the Bay Area remains a moderate nonattainment area for the federal CO standard.

Other Pollutants. The Bay Area is designated as an attainment area for the state and federal NO_2, SO_2, and Pb standards. The Bay Area is designated as a nonattainment area for the state PM_{10} standard, and is unclassified with regard to the federal PM_{10} standard.

Plans and Policies

The Bay Area Air Quality Plan and MTC Resolutions on Conformity. The BAAQMD is the local agency responsible for implementing state and federal air quality requirements. Responsibility for enforcement of federal requirements is a result of EPA approval of the *1982 Bay Area Air Quality Plan* (referred to as the 1982 Plan), also known as the State Implementation Plan or SIP, which indicates how the BAAQMD will implement federal air quality requirements. The BAAQMD updated the 1982 Plan and adopted the *Bay Area '91 Clean Air Plan* (BAAQMD, 1991) to implement the requirements of the California Clean Air Act of 1988. As required by the California Clean Air Act and subsequent 1992 amendments, the BAAQMD also prepared the *1994 Clean Air Plan Update* (BAAQMD, 1994). In connection with its September 1993 adoption of a request for redesignation of the Bay Area as a federal ozone attainment area, the BAAQMD prepared and submitted to the EPA a Maintenance Plan describing how the Bay Area would maintain its attainment of the federal ozone standard. EPA approval of the redesignation request, in May 1995, also included approval of the Maintenance Plan as part of the SIP. The 1982 Plan, as amended, and the Maintenance Plan constitute the federally approved SIP for the Bay Area; conformity provisions of the 1990 Clean Air Act amendments specify the conditions under which transportation plans, programs, and projects will be considered to conform to the SIP and to the federal Clean Air Act.

The MTC is responsible for establishing that the Bay Area Regional Transportation Improvement Program (TIP) (MTC, 1993b) and Regional Transportation Plan (RTP) (MTC, 1993c) conform to the SIP. In November 1990, amendments to the Clean Air Act (described below) were passed that provided new direction for reviewing air quality effects of transportation projects. In April 1991, MTC adopted Resolution No. 2270 (MTC, 1991) to ensure that the air quality effects of a project conform to the SIP and that the project is consistent with transportation control measures. The resolution contains two key appendices: *Conformity Assessment Procedures*, which MTC has used to establish that the TIP and RTP are in conformity with the 1982 Plan and the Clean Air Act; and *Criteria for Project Conformity*, which establishes the criteria and conformity assessment procedures for individual transportation projects. Further, in response to the requirements of the EPA conformity regulation (discussed below), MTC has prepared and submitted to the EPA the *San Francisco Bay Area Transportation Conformity Procedures* (MTC, 1994). Upon EPA approval for inclusion in the SIP, these conformity procedures will supersede Resolution No. 2270 and the conformity procedures contained in the 1982 Plan.

In November 1995, MTC began the process of amending the TIP to specifically include the design concept and scope of the Aerial Design Option as the LPA and to program funding for the project. On February 28, 1996, MTC amended the TIP to reflect these changes as well as a number of other new and revised projects. MTC concurrently approved the *Supplemental Air Quality Conformity Assessment for*

1995 TIP. The supplemental assessment concludes that the amended TIP continues to conform to the SIP.

EPA Conformity Regulations. As amended in 1990, the federal Clean Air Act provides the current framework for air conformity. The Clean Air Act defines conformity to a SIP to mean:

> Conformity to an implementation plan's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and achieving expeditious attainment of such standards...

Section 176(c) of the Clean Air Act specifies that no federal agency may approve, support, or fund an activity that does not conform to the applicable implementation plan.

In late 1993, the EPA promulgated final rules for determining conformity of transportation plans, programs, and projects. These final rules, which are codified in the Code of Federal Regulations (CFR) Title 40, Part 93, Subpart A, govern the conformity assessment for this project.

Ambient Air Quality

The BAAQMD operates air quality monitoring stations throughout the region. The San Francisco monitoring station at 10 Arkansas Street and the Redwood City monitoring station are the two stations closest to the project corridor, and therefore are the most appropriate for defining background air quality for the project. The San Francisco station is located about eight miles north of the northern end of the corridor, and the Redwood City station is about ten miles south of the southern end of the project corridor. Table 3.10-2 presents a summary of the ambient air quality measured at the San Francisco and Redwood City monitoring stations.

Sensitive Receptors

The criteria air pollutants (O_3, CO, NO_2, SO_X, PM_{10}, and Pb) are recognized to have a variety of health effects on humans. Research shows that exposure to high concentrations of these air pollutants can trigger respiratory diseases such as asthma and bronchitis, other respiratory ailments, and cardiovascular diseases. Exposure to these pollutants during strenuous physical activity may cause shortness of breath and chest pains. Population groups that are particularly sensitive or susceptible to adverse health effects associated with air pollution are referred to as "sensitive receptors" and include children, elderly people, and acutely ill people (especially those with cardio-respiratory diseases). The state and federal ambient air quality standards are "health-based" levels that should not cause significant adverse health effects in these sensitive populations.

Sensitive receptor locations along the project corridor include residential areas with children and/or elderly people. Residential areas are located near a number of the roadway intersections and BART station parking facilities in the project corridor. Other sensitive receptor locations include El Camino High School, located immediately northeast of the intersection of Mission Road and Evergreen Avenue; the Kaiser Medical Center, located near the intersection of Mission Road and Grand Avenue; Los Cerritos Elementary School and South San Francisco High School, located west of the SPTCo right-of-way between West Orange and South Spruce Avenues; Belle Air Elementary School, located at the south end of 7th Avenue in San Bruno; Lomita Park School, located on San Antonio Avenue at the San Bruno/ Millbrae city limit; and nursing homes on both Serra Avenue and California Drive in Burlingame.

Table 3.10-2
Ambient Air Quality Summary
San Francisco and Redwood City Monitoring Stations

		Standard [1]		Maximum Concentration [2]					Second Highest Concentration [2, 3]					Number of Days Exceeding California Standard [4]				
Pollutant	Averaging Time	State	Federal	1989	1990	1991	1992	1993	1989	1990	1991	1992	1993	1989	1990	1991	1992	1993
Ozone	1-hour	0.09 ppm [5]	0.12 ppm	0.10	0.08	0.08	0.09	0.08	0.09	0.06	0.07	0.07	0.08	1	0	0	0	0
Carbon Monoxide	8-hour	9.0 ppm	9 ppm	5.3	5.9	6.5	4.8	5.1	5.3	5.8	5.6	4.6	4.8	0	0	0	0	0
	1-hour	20 ppm	35 ppm	13	12	11	12	7	13	12	10	11	6	0	0	0	0	0
Nitrogen Dioxide	Annual	none	0.05 ppm	0.024	0.022	0.021	0.021	0.024	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	1-hour	0.25 ppm	none	0.12	0.12	0.12	0.10	0.08	0.11	0.12	0.11	0.10	0.08	0	0	0	0	0
Sulfur Dioxide	Annual	none	0.03 ppm	0.003	0.001	0.002	0.002	0.001	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	24-hour	0.04 ppm [5]	0.14 ppm	0.017	0.012	0.016	0.013	0.011	NR	0.011	0.014	0.012	0.010	0	0	0	0	0
	1-hour	0.25 ppm	none	0.05	0.03	0.04	0.04	0.04	0.04	0.03	0.04	0.03	0.04	0	0	0	0	0
Particulate Matter	Annual [6]	30 $\mu g/m^3$	50 $\mu g/m^3$	33.3	28.2	32.1	24.9	22.9	NA	NA	NA	NA	NA	1	0	1	0	0
	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$	90	137	90	80	69	84	93	84	75	64	10	8	12	7	5

Source: California Air Resources Board (CARB) (1989 through 1993). Sulfur dioxide data were collected at the Redwood City monitoring station. All other data were collected at the San Francisco monitoring station at 10 Arkansas Street.

Notes:

1) State standards are not to be exceeded. The federal standard for ozone and federal standards based on annual averages are not to be exceeded. All other federal standards are not to be exceeded more than once per year.

2) Concentration units for a given pollutant are the same as those shown for the corresponding state and federal standards.

3) "NA" means not applicable; there is only one average annual concentration.

4) For standards based on annual averages, a value of 1 indicates that the standard was exceeded. "NA" means not applicable; there is no corresponding state standard.

5) The state 24-hour average standard for sulfur dioxide changed from 0.05 ppm to 0.04 ppm on 1/1/93.

6) The state annual average particulate matter standard is compared against the annual geometric mean concentration. The federal annual average particulate matter standard is compared against the annual arithmetic mean concentration. The annual average particulate matter concentrations shown in the table are annual geometric mean values.

10.3 Impact Assessment and Mitigation

Significance Criteria

As the local agency responsible for implementing state air quality requirements, the BAAQMD has established guidelines for conducting the air quality analyses required by CEQA. The BAAQMD has defined numerical significance criteria for air quality impacts in *Air Quality and Urban Development - Guidelines for Assessing Impacts of Projects and Plans* (BAAQMD, 1985). Significance criteria for the BART extension have been adapted from the BAAQMD guidance in order to more closely reflect the current regulatory framework. Air quality impacts will be considered significant:

- For non-photochemically reactive pollutants (CO and PM_{10}), if project-specific emissions cause ambient air concentrations which, when added to background, result in a violation of a state or federal ambient air quality standard.
- For nonattainment pollutants (O_3, CO, and PM_{10}), if the net increase in regional emissions due to the project exceeds the applicable BAAQMD threshold in effect at the time of project approval. The threshold represents the level above which the BAAQMD requires the use of best available control technology (BACT) and/or the provision of offsetting emission reductions in order to obtain a permit for a new or modified stationary source. While not specifically applicable to transportation projects, this level represents the most conservative (lowest) emission level that could be considered significant for nonattainment pollutants. For O_3, the numerical emission offset threshold is applied to precursors measured as oxides of nitrogen (NO_X) and reactive organic gases (ROG).[1]
- For attainment pollutants (NO_2 and SO_2), if the net increase in regional emissions due to the project exceeds 150 lb/day.

Table 3.10-3 summarizes the numerical thresholds associated with the significance criteria established above.

Methodology

The methodologies used to determine project-specific impacts, cumulative impacts, and project conformity are described below. Air quality effects are evaluated in four calendar years: the "base year," 1993; the projected first year of operation, 1998; 2000; and 2010.

[1] Although the San Francisco Bay Area was designated as an attainment area for the federal O_3 standard in May 1995, the nonattainment O_3 significance criteria are retained for this analysis because the Bay Area remains a nonattainment area for the state ozone standard. Continued use of the nonattainment criteria to establish impact significance is conservative, because the nonattainment criteria are more stringent than the attainment criteria.

Table 3.10-3
Significance Thresholds for Air Pollutant Emissions

Pollutant	BACT/Emission Offset Threshold [1]	Net Increase Threshold [2]
Ozone [3]		
Oxides of Nitrogen (ozone precursor)	10 lb/highest day 15 ton/yr	NA [4]
Reactive Organic Gases (ozone precursor)	10 lb/highest day 15 ton/yr	NA
Carbon Monoxide	10 lb/highest day	NA
Nitrogen Dioxide	NA	150 lb/day
Sulfur Dioxide	NA	150 lb/day
Particulate Matter	10 lb/highest day 1 ton/yr	NA

Notes:

1) The BACT/emission offset threshold is applicable to a net increase in regional emissions of nonattainment pollutants.
2) The net increase threshold is applicable to a net increase in regional emissions of attainment pollutants.
3) For ozone, the BACT/emission offset threshold is applied to precursors measured as oxides of nitrogen and reactive organic gases. Although the San Francisco Bay Area was designated as an attainment area for the federal O_3 standard in May 1995, the nonattainment O_3 significance criteria are retained for this analysis for consistency with the earlier documents. Continued use of the nonattainment criteria to establish impact significance is conservative, because the nonattainment criteria are more stringent than the attainment criteria.
4) "NA" means not applicable. Project-Specific Impacts

Project-Specific Impacts

Regional Analysis. Regional air quality impacts were evaluated on the basis of total regional vehicular emissions. The "region" is the nine-county Bay Area air basin under the jurisdiction of the BAAQMD. The calculation of regional emissions was based on vehicle-miles-traveled (VMT) data supplied by MTC (1993c, 1994) and on vehicular pollutant emission factors estimated with an EPA-approved computer model. Peak-hour and daily VMT data were used in conjunction with the vehicular emission factors to estimate worst-case regional emissions in pounds per hour (lb/hr)and tons per year (ton/yr), respectively.

CEQA requires comparison of the Aerial Design Option LPA in future years against existing conditions. For this analysis, existing conditions are defined as the No Build Alternative in the 1993 base year. Thus, project-specific or "net" regional emissions for a given analysis year were calculated as the regional emissions under the Aerial Design Option LPA in the given analysis year minus the regional emissions under the No Build Alternative in the 1993 base year.

Local Analysis. Air pollutants associated with the Aerial Design Option LPA that are of concern on a local scale are PM_{10} and CO. Project-specific PM_{10} and CO emissions are produced by BART-associated vehicular traffic at roadway intersections and BART station parking facilities. Significant local impacts would occur if project-specific PM_{10} or CO emissions resulted in airborne PM_{10} or CO concentrations that, when added to background levels, exceeded a state or federal ambient air quality standard.

- **PM_{10}.** There is currently no EPA-approved model for analysis of local PM_{10} impacts, and quantitative analysis of local PM_{10} impacts is not required as part of the air conformity assessment. Local PM_{10} impacts were qualitatively evaluated on the basis of project-specific regional PM_{10} emissions, as calculated in the regional analysis. An overall net decrease in regional PM_{10} emissions could reasonably be interpreted to show that the project is unlikely to cause localized exceedances of the PM_{10} standards. This "build/No Build" test approach is specified by EPA, and is used by MTC in its evaluation of regional transportation plans and programs; this test can reasonably be assumed appropriate at the project level as well.

- **CO.** The analysis of local CO impacts was performed for roadway intersections and BART parking facilities where air quality impacts are expected to be greatest. The methodology for determining local CO impacts is consistent with typical CEQA/NEPA air quality impact analyses and with EPA conformity assessment procedures.

  Roadway intersections where air quality could be substantially affected by the project were determined by reviewing the traffic analysis, since local CO impacts are typically a function of vehicular traffic. Following EPA procedures and guidance, 24 intersections were selected for local CO analysis. The intersections selected included 1) those intersections where CO concentrations are expected to be highest and 2) those intersections expected to undergo the greatest change from existing conditions as a result of the project. Local CO impacts were also evaluated at parking facilities at the Tanforan and Millbrae Avenue Stations, where air quality impacts are expected to be greatest due to the relatively large number of vehicles exiting in the P.M. peak hour.

  Airborne CO concentrations were calculated at the selected roadway intersections and BART station parking facilities using EPA-approved computer models. Worst-case meteorological assumptions were assumed. Airborne CO concentrations were calculated at worst-case artificial receptor locations, purposely placed to determine the highest CO concentrations at each intersection.

  Project-specific or "net" CO concentrations were calculated to determine if the Aerial Design Option LPA alone would cause any exceedances of state or federal ambient CO standards. The net CO concentrations include only background CO levels and the contribution from traffic specifically attributable to the Aerial Design Option LPA.

Cumulative Impacts

Regional Analysis. Cumulative regional emissions were calculated for the Aerial Design Option LPA, TSM Alternative, and No Build Alternative. Comparison of cumulative regional emissions under the Aerial Design Option LPA with those under the No Build Alternative in the same analysis year provides a measure for determining the effects of the project on regional air quality.

Local Analysis. As noted above, local PM_{10} impacts were qualitatively evaluated on the basis of project-specific regional PM_{10} emissions. An overall net decrease in regional PM_{10} emissions could reasonably be interpreted to show that the project is unlikely to cause localized exceedances of the PM_{10} standards.

Cumulative CO concentrations were calculated to determine if the project would eliminate or reduce the number and severity of violations of the federal CO standards (see the conformity assessment discussion below). The cumulative CO concentrations include background CO levels and the contributions from existing traffic, background traffic growth, traffic attributable to approved and funded projects (i.e., those projects specifically incorporated into the No Build Alternative), traffic attributable to projects built under the TSM Alternative, and traffic specifically attributable to the Aerial Design Option LPA.

Conformity Assessment

In order to demonstrate conformity with the federally approved SIP and the 1990 Clean Air Act amendments, as required by MTC Resolution No. 2270, a project must: 1) come from a transportation plan and program (i.e., a RTP and TIP) that have been found to conform; and 2) eliminate or reduce the severity and number of localized violations of the federal ambient air quality standards in the area substantially affected by the project.

The Aerial Design Option LPA meets the first conformity criterion if 1) the Aerial Design Option LPA is included in the current RTP and TIP, and 2) the current RTP and TIP have been found to conform to the SIP.

To determine if the Aerial Design Option LPA meets the second conformity criterion, the cumulative CO concentrations near roadway intersections predicted under the Aerial Design Option LPA and the No Build Alternative in the 1998, 2000, and 2010 analysis years are compared with the federal CO ambient air quality standards. (Although 1993 base year analysis is required under CEQA, conformity assessment considers only those analysis years in which the project will be in operation.) If there are no new exceedances of the federal CO standards under the Aerial Design Option LPA, then the project satisfies this criterion. This policy position is provided in the preamble to the final EPA conformity rule (58 CFR 62212) (EPA, 1993).

Project-Specific Analysis

Regional Impacts

1. *Emissions of NO_X and ROG under the Aerial Design Option LPA in all analysis years are less than those under existing conditions. Consequently, net emissions of NO_X and ROG in all analysis years are negative and are less than the significance criterion of 10 lb/highest day or 15 ton/yr. (B)*

2. *Emissions of CO under the Aerial Design Option LPA in all analysis years are less than those under existing conditions. Consequently, net emissions of CO in all analysis years are negative and are less than the significance criterion of 10 lb/highest day. (B)*

3. *Emissions of PM_{10} under the Aerial Design Option LPA in all analysis years are less than those under existing conditions. Consequently, net emissions of PM_{10} in all analysis years are negative and are less than the significance criterion of 10 lb/highest day or 1 ton/yr. (B)*

Regional vehicular emissions under the Aerial Design Option LPA and under the No Build Alternative are presented in Table 3.10-4. In all analysis years, regional emissions of NO_X, ROG, CO, and PM_{10} under the Aerial Design Option LPA are less than those under existing conditions (the No Build Alternative in the 1993 analysis year). Because there is a net decrease in emissions in all analysis years, the Aerial Design Option LPA would have a beneficial impact on regional air quality.

Local Impacts

4. *Regional emissions of PM_{10} under the Aerial Design Option LPA in all analysis years are less than those under existing conditions. This net decrease in regional PM_{10} emissions is interpreted to show that the project is unlikely to cause localized exceedances of the PM_{10} standards. (I)*

5. *The 1-hour average net CO concentration at Huntington Avenue/Sneath Lane and the Tanforan Station parking garage under the Aerial Design Option LPA in 1993 during the P.M. peak traffic hour is greater than the state 1-hour average CO ambient air quality standard. Net CO concentrations under the Aerial Design Option LPA do not exceed the state or federal 1-hour or 8-hour average CO ambient air quality standards at any other location in any analysis year. (I)*

   Table 3.10-5 shows maximum 1-hour average net CO concentrations under the Aerial Design Option LPA in 1993, 1998, 2000, and 2010, during the A.M. and P.M. peak traffic hours. These values are compared with the state and federal 1-hour average CO ambient air quality standards of 20 parts per million (ppm) and 35 ppm, respectively. Table 3.10-6 shows the corresponding 8-hour average net CO concentrations, for comparison with the state and federal 8-hour average CO standards of 9.0 ppm and 9 ppm, respectively.

   The maximum 1-hour average net CO concentration in the vicinity of the intersection of Huntington Avenue and Sneath Lane and the Tanforan Station parking garage under the Aerial Design Option LPA in 1993 during the P.M. peak traffic hour is 21.7 ppm, which is greater than the state 1-hour average CO ambient air quality standard of 20 ppm. However, the 1993 analysis of the Aerial Design Option LPA is an "artificial" one; CEQA requires an analysis of the project added to existing conditions (the No Build Alternative in the 1993 analysis year), even though the project (including the parking garage) would not be in operation until 1998. Since the project would not be in operation until 1998 and the net CO concentrations at Huntington/Sneath in 1998 and in subsequent years are below the ambient air quality standards, exceedance of the state CO standard at Huntington/Sneath in the 1993 analysis year is not a significant impact. The maximum 1-hour and 8-hour average net CO concentrations at every other location are below the ambient air quality standards in all analysis years (1993, 1998, 2000, and 2010).

Cumulative Analysis

Regional Emissions

Regional vehicular emissions under the Aerial Design Option LPA and under the No Build Alternative are presented in Table 3.10-4. In all analysis years, cumulative emissions of NO_X, ROG, CO, and PM_{10} under the Aerial Design Option LPA are less than those under the No Build Alternative in the same

Table 3.10-4
Regional Vehicle Miles Traveled and Associated Air Emissions

Alternative Year	Daily VMT (veh-mi/day)	Regional Emissions (ton/yr) Oxides of Nitrogen	Reactive Organic Gases	Carbon Monoxide	Particulate Matter	Peak-hour VMT (veh-mi/hr)	Regional Emissions (lb/hr) Oxides of Nitrogen	Reactive Organic Gases	Carbon Monoxide	Particulate Matter
Proposed Project – Aerial Design Option LPA										
1993	119,973,716	86,397	81,571	1,207,632	4,827	8,770,669	34,609	32,675	483,747	1,933
1998	137,251,189	72,887	61,291	892,868	3,313	9,582,651	27,884	23,448	341,581	1,267
2000	143,228,760	70,876	54,165	780,784	3,457	9,863,576	26,745	20,439	294,627	1,305
2010	153,198,079	58,552	25,886	390,138	3,082	10,332,100	21,638	9,566	144,175	1,139
Alternative I – No Build										
1993	120,379,907	86,690	81,847	1,211,720	4,843	8,800,406	34,726	32,786	485,387	1,940
1998	137,698,264	73,125	61,491	895,776	3,324	9,613,927	27,975	23,525	342,696	1,272
2000	143,689,980	71,104	54,339	783,298	3,468	9,895,385	26,831	20,505	295,577	1,309
2010	153,682,890	58,737	25,968	391,373	3,091	10,364,797	21,706	9,596	144,631	1,142
Alternative II – Transportation Systems Management (TSM)										
1993	119,827,198	86,292	81,471	1,206,157	4,821	8,759,979	34,566	32,635	483,157	1,931
1998	137,074,804	72,794	61,213	891,721	3,309	9,570,367	27,848	23,418	341,143	1,266
2000	143,042,043	70,783	54,094	779,766	3,453	9,850,741	26,710	20,412	294,243	1,303
2010	152,994,128	58,474	25,851	389,619	3,078	10,318,345	21,609	9,553	143,983	1,137

Notes:

1) "Regional" refers to the nine-county San Francisco Bay Area air basin under the jurisdiction of the BAAQMD.
2) Daily and peak-hour VMT for No Build Alternative and TSM Alternative provided by MTC. Daily and peak-hour VMT for the Aerial Design Option LPA assumed equal to VMT for 1992 LPA provided by MTC.
3) Emission factor assumptions (temperature, season, vehicle thermal states, speed) consistent with the MTC TIP/RTP.

Table 3.10-5
Aerial Design Option Locally Preferred Alternative
Highest Predicted 1-Hour Net Carbon Monoxide Concentrations (ppm)[1,2]
in the Vicinity of Roadway Intersections and BART Station Parking Facilities

Location	1993		1998		2000		2010	
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
El Camino Real/Hickey Boulevard	10.7	10.4	8.6	8.6	7.9	7.9	6.6	6.6
I-280 southbound ramps/Sneath Lane	10.4	10.5	8.6	8.6	8.0	7.9	6.7	6.6
Mission Road/Evergreen Drive	10.4	10.4	8.6	8.6	7.9	7.9	6.6	6.6
Mission Road/"new street"[3]	16.7	15.3	12.9	12.1	11.5	10.8	8.2	7.9
El Camino Real/"new street"[3]	17.4	18.0	13.5	13.7	12.0	12.2	8.4	8.4
Mission Road/Grand Avenue	11.2	10.4	9.1	8.6	8.4	7.9	6.8	6.6
Chestnut Avenue/Grand Avenue	10.4	11.1	8.8	8.7	8.1	8.2	6.7	6.7
Mission Road/Oak Avenue	10.4	10.4	8.6	8.6	7.9	7.9	6.6	6.6
El Camino Real/Arroyo Drive	10.4	10.4	8.6	8.6	7.9	7.9	6.9	6.8
Junipero Serra Boulevard/Westborough Boulevard	10.5	10.6	8.7	8.6	7.9	7.9	6.6	6.6
El Camino Real/Westborough Boulevard	10.4	11.1	8.6	8.8	7.9	8.1	6.6	6.6
El Camino Real/South Spruce Avenue	10.4	10.4	9.0	8.6	7.9	7.9	6.6	6.6
El Camino Real/Sneath Lane	10.8	10.9	8.8	9.0	8.1	8.4	6.7	6.7
Huntington Avenue/Sneath Lane – Tanforan Station Parking[4]	12.5	*21.7*	9.7	16.8	9.4	14.7	6.9	8.8
El Camino Real/San Bruno Avenue	11.0	10.4	9.2	8.9	8.7	9.0	7.1	7.1
San Mateo Avenue/San Bruno Avenue	11.5	10.4	9.1	8.8	8.5	8.3	7.0	6.7
2nd Avenue/San Bruno Avenue	11.8	10.4	9.4	8.9	8.1	8.2	7.2	6.6
San Mateo Avenue/Huntington Avenue	11.3	11.9	9.4	9.6	8.6	9.0	7.0	6.7
Huntington Avenue/Angus Avenue	11.0	12.3	9.0	9.9	8.3	9.0	6.8	7.0
El Camino Real/Center Street	10.4	10.4	8.6	9.2	7.9	8.3	6.6	6.8
El Camino Real/Millbrae Avenue	11.9	10.8	9.9	9.1	9.4	7.9	7.4	6.6
Rollins Road/Millbrae Avenue – Millbrae Station Parking[4]	17.7	19.1	13.9	14.0	12.5	11.8	8.2	8.1
El Camino Real/Murchison Drive	11.9	10.4	9.2	8.6	8.6	8.0	7.1	6.7
California Drive/Broadway Avenue	10.7	10.7	8.6	8.6	7.9	8.1	6.6	6.6

Notes:

1) One-hour net concentration ($C_{N,1\text{-hr}}$) calculated as the highest predicted 1-hr concentration (not including background) under the LPA ($C_{1\text{-hr}}$) minus the predicted 1-hr concentration (not including background) under the TSM Alternative at the same receptor location ($C_{TSM,\,1\text{-hr}}$), plus the 1-hr background concentration ($B_{1\text{-hr}}$):

$$C_{N,1\text{-hr}} = (C_{1\text{-hr}} - C_{TSM,\,1\text{-hr}}) + B_{1\text{-hr}}$$

2) Values in *italic* font style are greater than the state 1-hour average ambient CO standard of 20 ppm. Values in **bold** font style are greater than the federal 1-hour average ambient CO standard of 35 ppm.

3) "New street" does not exist under the TSM Alternative. Therefore, all impacts are considered BART-related; net and cumulative concentrations are equal.

4) The predicted CO concentrations include contributions from both the roadway intersection and the adjacent BART station parking facilities.

Table 3.10-6

Aerial Design Option Locally Preferred Alternative

Highest Predicted 8-Hour Net Carbon Monoxide Concentrations (ppm) [1,2]

in the Vicinity of Roadway Intersections and BART Station Parking Facilities

	1993		1998		2000		2010	
Location	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
El Camino Real/Hickey Boulevard	4.4	4.2	3.5	3.5	3.2	3.2	2.7	2.7
I-280 southbound ramps/Sneath Lane	4.2	4.3	3.5	3.5	3.3	3.2	2.8	2.7
Mission Road/Evergreen Drive	4.2	4.2	3.5	3.5	3.2	3.2	2.7	2.7
Mission Road/"new street" [3]	7.9	7.1	6.0	5.6	5.3	4.9	3.6	3.5
El Camino Real/"new street" [3]	8.3	8.7	6.4	6.5	5.6	5.7	3.8	3.8
Mission Road/Grand Avenue	4.7	4.2	3.8	3.5	3.5	3.2	2.8	2.7
Chestnut Avenue/Grand Avenue	4.2	4.6	3.6	3.6	3.3	3.4	2.8	2.8
Mission Road/Oak Avenue	4.2	4.2	3.5	3.5	3.2	3.2	2.7	2.7
El Camino Real/Arroyo Drive	4.2	4.2	3.5	3.5	3.2	3.2	2.9	2.8
Junipero Serra Boulevard/Westborough Boulevard	4.3	4.3	3.6	3.5	3.2	3.2	2.7	2.7
El Camino Real/Westborough Boulevard	4.2	4.6	3.5	3.6	3.2	3.3	2.7	2.7
El Camino Real/South Spruce Avenue	4.2	4.2	3.7	3.5	3.2	3.2	2.7	2.7
El Camino Real/Sneath Lane	4.4	4.5	3.6	3.7	3.3	3.5	2.8	2.8
Huntington Avenue/Sneath Lane – Tanforan Station Parking [4]	5.4	7.6	4.1	6.0	4.0	5.3	2.9	3.3
El Camino Real/San Bruno Avenue	4.6	4.2	3.9	3.7	3.7	3.8	3.0	3.0
San Mateo Avenue/San Bruno Avenue	4.8	4.2	3.8	3.6	3.6	3.4	2.9	2.8
2nd Avenue/San Bruno Avenue	5.0	4.2	4.0	3.7	3.3	3.4	3.1	2.7
San Mateo Avenue/Huntington Avenue	4.7	5.1	4.0	4.1	3.6	3.8	2.9	2.8
Huntington Avenue/Angus Avenue	4.6	5.3	3.7	4.3	3.4	3.8	2.8	2.9
El Camino Real/Center Street	4.2	4.2	3.5	3.9	3.2	3.4	2.7	2.8
El Camino Real/Millbrae Avenue	5.1	4.4	4.3	3.8	4.1	3.2	3.2	2.7
Rollins Road/Millbrae Avenue – Millbrae Station Parking [4]	7.9	8.8	6.2	6.3	5.6	5.2	3.5	3.5
El Camino Real/Murchison Drive	5.1	4.2	3.9	3.5	3.6	3.3	3.0	2.8
California Drive/Broadway Avenue	4.4	4.4	3.5	3.5	3.2	3.3	2.7	2.7

Notes:

1) Eight-hour net concentration ($C_{N,8\text{-hr}}$) calculated as the highest predicted 1-hr concentration (not including background) under the LPA ($C_{1\text{-hr}}$) minus the predicted 1-hr concentration (not including background) under the TSM Alternative at the same receptor location ($C_{TSM,1\text{-hr}}$), multiplied by the persistance factor (PF), plus the 8-hr background concentration ($B_{8\text{-hr}}$):

$$C_{N,8\text{-hr}} = (C_{1\text{-hr}} - C_{TSM,1\text{-hr}}) \times PF + B_{8\text{-hr}}$$

2) Values in *italic* font style are greater than the state 8-hour average ambient CO standard of 9.0 ppm. Values in **bold** font style are greater than the federal 8-hour average ambient CO standard of 9 ppm.

3) "New street" does not exist under the TSM Alternative. Therefore, all impacts are considered BART-related; net and cumulative concentrations are equal.

4) The predicted CO concentrations include contributions from both the roadway intersection and the adjacent BART station parking facilities.

analysis year and less than those under the existing baseline condition (the No Build Alternative in the 1993 analysis year). Because there is a net decrease in emissions in all analysis years, the Aerial Design Option LPA would have a beneficial cumulative impact on regional air quality.

Local CO Concentrations

Table 3.10-7 shows maximum 1-hour average cumulative CO concentrations under the Aerial Design Option LPA in 1993, 1998, 2000, and 2010, during the A.M. and P.M. peak traffic hours. These values are compared with the state and federal 1-hour average CO ambient air quality standards of 20 ppm and 35 ppm, respectively. Table 3.10-8 shows the corresponding 8-hour average cumulative CO concentrations, for comparison with the state and federal 8-hour average CO standards of 9.0 ppm and 9 ppm, respectively.

The maximum 1-hour and 8-hour average cumulative CO concentrations at every intersection are below the corresponding state and federal CO ambient air quality standards in all future analysis years (1998, 2000, and 2010). The maximum 1-hour and 8-hour average cumulative CO concentrations at several intersections exceed the corresponding state and federal CO ambient air quality standards in the 1993 analysis year.

The 1993 analysis of the Aerial Design Option LPA is an "artificial" one; CEQA requires an analysis of the project added to existing conditions (the No Build Alternative in the 1993 analysis year), even though the project would not be in operation until 1998. Since the project would not be in operation until 1998 and the cumulative CO concentrations in 1998 and subsequent years are below the ambient air quality standards, exceedances of the ambient air quality standards at several intersections in the 1993 analysis year are not significant.

Conformity Assessment

The Aerial Design Option LPA is in conformance with the 1982 Plan and Clean Air Act requirements for transportation projects, based on the EPA final conformity rule and MTC Resolution No. 2270.

The BART–San Francisco Airport Extension is included in the RTP and the FY 1992-1996 TIP. The MTC has made findings of conformity for the RTP and TIP in relation to the 1982 Plan (MTC Resolution Nos. 2339 and 2333, respectively). The EPA and the Department of Transportation determined on November 14, 1991 that the RTP and TIP conform as required. On February 28, 1996, MTC amended the TIP to specifically include the design concept and scope of the Aerial Design Option LPA and concurrently approved the *Supplemental Air Quality Conformity Assessment for 1995 TIP*, which concludes that the amended TIP continues to conform to the SIP. Therefore, the Aerial Design Option LPA meets the first criterion for conformity to the 1982 Plan and Clean Air Act requirements for transportation projects.

The maximum 1-hour and 8-hour average cumulative CO concentrations at all intersections under the Aerial Design Option LPA are below the federal CO ambient air quality standards in all future analysis years (1998, 2000, and 2010). Therefore, the Aerial Design Option LPA meets the second criterion for conformity to the 1982 Plan and Clean Air Act requirements for transportation projects.

Table 3.10-7

Aerial Design Option Locally Preferred Alternative

Highest Predicted 1-Hour Cumulative Carbon Monoxide Concentrations (ppm) [1,2]

in the Vicinity of Roadway Intersections and BART Station Parking Facilities

	1993		1998		2000		2010	
Location	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
El Camino Real/Hickey Boulevard	*20.7*	*22.2*	15.5	16.8	13.7	14.8	9.2	9.7
I-280 southbound ramps/Sneath Lane	12.8	13.8	10.3	10.7	9.3	9.7	7.1	7.3
Mission Road/Evergreen Drive	16.0	16.2	12.4	12.5	11.1	11.1	8.0	8.0
Mission Road/"new street" [3]	16.7	15.3	12.9	12.1	11.5	10.8	8.2	7.9
El Camino Real/"new street" [3]	17.4	18.0	13.5	13.7	12.0	12.2	8.4	8.4
Mission Road/Grand Avenue	19.2	19.3	14.5	14.7	12.8	13.0	8.8	8.8
Chestnut Avenue/Grand Avenue	16.9	18.5	13.1	13.8	11.7	12.3	8.3	8.5
Mission Road/Oak Avenue	11.0	10.9	8.9	8.9	8.2	8.2	6.7	6.6
El Camino Real/Arroyo Drive	15.2	15.5	11.9	12.2	10.6	10.8	7.9	8.2
Junipero Serra Boulevard/Westborough Boulevard	16.8	18.8	13.0	14.1	11.4	12.3	8.0	8.2
El Camino Real/Westborough Boulevard	19.9	*20.9*	15.1	15.4	13.0	13.5	8.7	9.0
El Camino Real/South Spruce Avenue	16.6	17.5	12.9	13.4	11.2	12.0	7.9	8.2
El Camino Real/Sneath Lane	18.1	19.3	13.6	14.8	12.2	12.9	8.1	8.7
Huntington Avenue/Sneath Lane – Tanforan Station Parking [4]	15.7	*26.1*	11.9	19.7	10.6	17.1	7.7	9.9
El Camino Real/San Bruno Avenue	17.4	17.8	13.4	14.0	11.7	12.4	8.2	8.4
San Mateo Avenue/San Bruno Avenue	18.6	18.4	14.1	14.1	12.4	12.5	8.5	8.7
2nd Avenue/San Bruno Avenue	18.5	18.2	14.0	14.1	12.1	12.4	8.2	8.5
San Mateo Avenue/Huntington Avenue	13.6	13.8	10.7	10.9	9.4	9.8	7.2	7.3
Huntington Avenue/Angus Avenue	16.0	19.4	12.5	14.7	11.2	13.0	8.1	8.8
El Camino Real/Center Street	18.3	19.2	13.9	14.4	12.3	12.7	8.5	8.7
El Camino Real/Millbrae Avenue	16.0	16.5	12.8	12.7	11.5	11.0	8.0	7.7
Rollins Road/Millbrae Avenue – Millbrae Station Parking [4]	*21.7*	*21.8*	16.7	16.9	14.4	14.4	9.0	9.3
El Camino Real/Murchison Drive	16.7	16.6	12.9	13.0	11.4	11.4	8.0	7.8
California Drive/Broadway Avenue	17.3	17.4	13.0	13.3	11.5	11.9	8.0	8.0

Notes:

1) One-hour cumulative concentration ($C_{C,\ 1\text{-hr}}$) calculated as the highest predicted 1-hr concentration (not including background) under the LPA ($C_{1\text{-hr}}$) plus the 1-hr background concentration ($B_{1\text{-hr}}$):

$$C_{C,\ 1\text{-hr}} = C_{1\text{-hr}} + B_{1\text{-hr}}$$

2) Values in *italic* font style are greater than the state 1-hour average ambient CO standard of 20 ppm. Values in **bold** font style are greater than the federal 1-hour average ambient CO standard of 35 ppm.

3) "New street" does not exist under the TSM Alternative. Therefore, all impacts are considered BART-related; net and cumulative concentrations are equal.

4) The predicted CO concentrations include contributions from both the roadway intersection and the adjacent BART station parking facilities.

Table 3.10-8
Aerial Design Option Locally Preferred Alternative
Highest Predicted 8-Hour Cumulative Carbon Monoxide Concentrations (ppm)[1,2]
in the Vicinity of Roadway Intersections and BART Station Parking Facilities

	1993		1998		2000		2010	
Location	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
El Camino Real/Hickey Boulevard	***10.3***	***11.2***	7.5	8.3	6.6	7.2	4.2	4.5
1-280 southbound ramps/Sneath Lane	5.6	6.2	4.5	4.7	4.0	4.3	3.0	3.1
Mission Road/Evergreen Drive	7.5	7.6	5.7	5.8	5.1	5.1	3.5	3.5
Mission Road/"new street"[3]	7.9	7.1	6.0	5.6	5.3	4.9	3.6	3.5
El Camino Real/"new street"[3]	8.3	8.7	6.4	6.5	5.6	5.7	3.8	3.8
Mission Road/Grand Avenue	***9.4***	***9.5***	7.0	7.1	6.1	6.2	4.0	4.0
Chestnut Avenue/Grand Avenue	8.0	9.0	6.2	6.6	5.4	5.8	3.7	3.8
Mission Road/Oak Avenue	4.6	4.5	3.7	3.7	3.4	3.4	2.8	2.7
El Camino Real/Arroyo Drive	7.0	7.2	5.4	5.6	4.8	4.9	3.5	3.6
Junipero Serra Boulevard/Westborough Boulevard	8.0	*9.2*	6.1	6.7	5.3	5.8	3.5	3.6
El Camino Real/Westborough Boulevard	***9.8***	***10.4***	7.3	7.5	6.2	6.5	3.9	4.1
El Camino Real/South Spruce Avenue	7.9	8.4	6.0	6.3	5.1	5.6	3.5	3.6
El Camino Real/Sneath Lane	8.7	***9.5***	6.4	7.2	5.7	6.2	3.6	3.9
Huntington Avenue/Sneath Lane – Tanforan Station Parking[4]	7.3	***10.7***	5.4	8.1	4.8	6.8	3.4	4.0
El Camino Real/San Bruno Avenue	8.3	8.6	6.3	6.7	5.4	5.9	3.6	3.8
San Mateo Avenue/San Bruno Avenue	9.0	8.9	6.7	6.7	5.9	5.9	3.8	3.9
2nd Avenue/San Bruno Avenue	9.0	8.8	6.7	6.7	5.7	5.9	3.6	3.8
San Mateo Avenue/Huntington Avenue	6.1	6.2	4.7	4.9	4.1	4.3	3.1	3.1
Huntington Avenue/Angus Avenue	7.5	***9.5***	5.8	7.1	5.1	6.2	3.6	4.0
El Camino Real/Center Street	8.9	*9.4*	6.6	6.9	5.8	6.0	3.8	3.9
El Camino Real/Millbrae Avenue	7.5	7.8	6.0	5.9	5.3	5.0	3.5	3.3
Rollins Road/Millbrae Avenue – Millbrae Station Parking[4]	***10.3***	***10.4***	7.9	8.0	6.7	6.7	4.0	4.2
El Camino Real/Murchison Drive	7.9	7.9	6.0	6.1	5.3	5.3	3.5	3.4
California Drive/Broadway Avenue	8.3	8.3	6.1	6.3	5.3	5.6	3.5	3.5

Notes:

1) Eight-hour cumulative concentration ($C_{C,\,8\text{-hr}}$) calculated as the highest predicted 1-hr concentration (not including background) under the LPA ($C_{1\text{-hr}}$), times the persistence factor (PF), plus the 1-hr background concentration ($B_{1\text{-hr}}$):

$$C_{N,8\text{-hr}} = C_{1\text{-hr}} \times PF + B_{8\text{-hr}}$$

2) Values in *italic* font style are greater than the state 8-hour average ambient CO standard of 9.0 ppm. Values in **bold** font style are greater than the federal 8-hour average ambient CO standard of 9 ppm.

3) "New street" does not exist under the TSM Alternative. Therefore, all impacts are considered BART-related; net and cumulative concentrations are equal.

4) The predicted CO concentrations include contributions from both the roadway intersection and the adjacent BART station parking facilities

Section 11
Public Health and Safety

11.1 Introduction

This section of the FEIR/FEIS describes existing and potential sources of environmental hazards, assesses potential impacts to public health and safety from these hazards, and recommends mitigation measures to reduce impacts below a level of significance.[1] For the purposes of this report, discussion of environmental hazards is divided into the subsections "Hazardous Materials" and "Electromagnetic Fields." The evaluation of public health and safety impacts is based in part on the findings of the Hazardous Materials Technical Report prepared for this FEIR/FEIS. Other potential health and safety impacts are addressed elsewhere in this chapter: fire protection and crime prevention are addressed in Section 3.5, Community Services and Facilities; impacts related to water quality are described in Section 3.8, Hydrology and Water Quality; impacts related to air quality are presented in Section 3.10, Air Quality; and impacts specifically related to project construction are addressed later in Section 3.13, Construction.

11.2 Existing Conditions

Hazardous Materials

As defined in Chapter 6.95 of Division 20 of the California Health and Safety Code, Section 25501(k), a hazardous material is:

> ...any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. "Hazardous materials" include, but are not limited to, hazardous substances, hazardous waste, and any material which a handler or the administering agency has a reasonable basis for believing that it would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

Hazardous Materials Sites in the Project Corridor

From the activities described below, 265 known and potentially hazardous sites were identified within and adjacent to the project corridor. This discussion highlights those sites of greatest concern for the BART extension, based on the activities described below.

- **Database Search.** A records search of regulatory agency database lists[2] identified 256 known and suspected hazardous sites that could affect the project corridor.
- **Physical Inspection.** A walk-through inspection of the SPTCo right-of-way revealed six industrial businesses adjacent to the right-of-way with a potential to impact the project corridor.

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1 A Hazardous Materials Technical Report is available for further reference from the BART offices at 1000 Broadway, Oakland, California.

2 National Priorities List (NPL) Site; EPA Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) Site: Resource Conservation and Recovery Act (RCRA) Treatment, Storage, Disposal (TDS) Facility; RCRA Notifier (Generator and/or Transporter); Emergency Response Notification System (ERNS) Spill Site; State Bond Expenditure Plan (BEP) Site; Registered Underground Storage Tank (RUST); Site; State Landfill Leaking Underground Storage Tank (LUST) Site.

- **Information Review.** A review of available site information from previous environmental site assessments in the project corridor; from Sanborn maps; and from contacts with Bay Area RWQCB, San Mateo County Department of Environmental Health, and SFIA personnel revealed three uses with potential hazardous materials, and numerous historical sites with the potential to affect the project corridor, that were not identified during the database lists search, physical inspection, or drive-by reconnaissance.

Based on the above-described review, a list of 32 sites deemed to be of highest priority for further investigation by BART has been prepared (Table 3.11-1). High priority sites include (in order of importance):

- RCRA TSD facilities, which are known hazardous waste handlers (one site);
- CERCLIS sites with a history of regulatory action (one site), or suspected hazardous materials onsite based on the type of industry (one site, a dry cleaner);
- State BEP sites adjacent to the alternative alignments and with leaking underground storage tank (LUST) listings (two sites);
- LUST sites adjacent to the alternative alignments sorted by Map I.D. No. (18 sites); and
- Adjacent sites not identified from the database search but from observed poor waste management practices (two sites), types of industry (four sites), and review of Sanborn maps (one site) and other documents (two sites).

These sites may require additional investigation during the Phase I hazardous materials site assessment to be performed for the Aerial Design Option LPA, and will include regulatory agency file review, physical site inspection, and sampling to fully disclose public health hazards they may pose.

Site Characterization and Remediation Activities

Prior to construction activity in the project corridor, BART or a qualified professional retained by BART will perform an in-depth characterization of the nature and extent of hazardous materials contamination in the project corridor. This investigation, known as Phase I and Phase II hazardous materials site assessments, will be performed prior to property acquisition. If contamination is identified during the site investigation, landowners will be required to perform additional investigation and mitigation or cleanup under review of responsible regulatory agencies, as necessary. Mitigation and remediation activities will be generally completed before construction could proceed at a given site. However, for some types of contamination, particularly where fuel has leaked into soil and groundwater, remediation and clean up activities may be ongoing throughout construction.

Electromagnetic Fields

There has been increasing public concern about the potential health effects associated with electromagnetic fields from transmission lines, electrical facilities, and electrical appliances. Electric charges produce two kinds of fields: electric fields triggered by the voltage (or electrical pressure) in a line, and magnetic fields resulting from the current (or the flow of electric charges) in a line. Collectively, these are referred to as electromagnetic fields (EMF). EMF are found throughout nature

Table 3.11-1
List of Highest Priority
Known or Suspected Hazardous Sites in the Project Corridor

Map ID No.[1]	Site Name and Address	Basis for Priority Listing	Source Status
288C	DuPont Automotive Service Center 160 S. Linden Ave. S. San Francisco, CA 94080	CERCLIS [2]; Physical inspection, type of industry	Suspected
550C	International Paint Co. (Calif.), Inc. 220 S. Linden Ave. S. San Francisco, CA 94080	CERCLIS; RCRA TSD [3] facility, type of industry	Suspected
41000014	Kaiser Permanente 1200 El Camino Real S. San Francisco, CA 94080	State BEP [4]; LUST [5] site	Known
41002342	HS Crocker (now Sky Park) 1000 San Mateo Ave. San Bruno, CA 94066	State BEP; LUST site	Known
41004401	Victors Cleaners 600 San Mateo Ave. San Bruno, CA 94066	CERCLIS; Physical inspection, type of industry	Suspected
L22914	Ron Price Motors 1 Chestnut Ave. S. San Francisco, CA 94080	LUST site	Known
L23460	Treasure Island Trailer Court 1609 Old Mission Rd. S. San Francisco, CA 94080	LUST site	Known
L4508	Avis Rent-a-Car SFIA	LUST site, document review	Known
L4528	Chevron 1198 Old Mission Rd. S. San Francisco, CA 94080	LUST site, document review	Known
L4526	Chevron SFIA	LUST site, document review	Known
L4614	National Car Rental SFIA	LUST site, document review	Known
L4616	San Bruno Lumber 101 San Bruno Ave. San Bruno, CA 94066	LUST site, document review	Known
L4620	Pacific Bell 1465 Huntington S. San Francisco, CA 94080	LUST site	Known
L4627	Peninsula Tow Service 1071 Montgomery Ave. San Bruno, CA 94066	LUST site, document review	Known
L4701	UNOCAL 170 San Bruno Ave. San Bruno, CA 94066	LUST site	Known

Table 3.11-1 (continued)
List of Highest Priority
Known or Suspected Hazardous Sites in the Project Corridor

Map ID No.[1]	Site Name and Address	Basis for Priority Listing	Source Status
L4912	Exxon 310 San Bruno Ave. E San Bruno, CA 94066	LUST site	Known
L5089	Dept. of Public Works 225 Huntington Ave. San Bruno, CA 94066	LUST site, document review	Known
L5113	Hertz Rental Car SFIA	LUST site, document review	Known
L5199	Autohaus 675 San Bruno Ave. E San Bruno, CA 94066	LUST site	Known
L5505	Flat Rate Rent-a-Car 830 Huntington Ave. San Bruno, CA 94066	LUST site	Known
L5672	BP Oil 717 San Bruno Ave. E San Bruno, CA 94066	LUST site	Known
L5707	Federal Supply Warehouse 1070 San Mateo Ave. S. San Francisco, CA 94080	LUST site	Known
L5978	Acutec Autos 45 Chestnut Ave. S. San Francisco, CA 94080	LUST site	Known
A	Cypress Lawn Cemetery Maintenance Building Mission Rd. Colma, CA 94014	Physical inspection, poor waste management practices	Suspected
B	Italian Cemetery Maintenance Building El Camino Real Colma, CA 94014	Physical inspection, poor waste management practices	Suspected
C	Steven Engineering Ryan Way. S. San Francisco, CA 94080	Physical inspection, type of industry	Suspected
D	Vince's Shellfish Company 1063 Montgomery Ave. San Bruno, CA 94066	LUST site, document review	Known
E	Royal Container Company 106 E. Millbrae Ave. Millbrae, CA 94030	Sanborn Maps, type of industry	Suspected
Photo Location #3	B Metal Fabrication Inc. S. Maple S. San Francisco, CA 94080	Physical inspection, type of industry	Suspected

Table 3.11-1 (continued)
List of Highest Priority
Known or Suspected Hazardous Sites in the Project Corridor

Map ID No.[1]	Site Name and Address	Basis for Priority Listing	Source Status
Photo Location #4	Goss-Jewett Co. Browning Way (off S. Maple) S. San Francisco, CA 94080	Physical inspection, type of industry	Suspected
Photo Location #7	Zellerbach S. Spruce S. San Francisco, CA 94080	Physical inspection, type of industry	Suspected
Photo Location #49	Pan Am Hangar (Plot 1 SFIA) Now United Airlines SFIA	Readily available information, type of industry	Suspected

Source: Ogden, Hazardous Materials Technical Report, 1993; Environmental Database, Inc., 1993.

Notes:

1) Map ID numbers are based on site identification numbers: #C=CERCLIS sites; L#=LUST sites; #=CALSITE or BEP site; A, B, C, D or E=Ogden site identifiers from physical inspection; and Photo Location #=Ogden site identifiers from physical inspection where photographs were taken.
2) CERCLIS – Comprehensive Environmental Response and Liability Information System Treatment, Storage and/or Disposal Facility.
3) RCRA TSD – Resource Conservation and Recovery Act Treatment, Storage and/or Disposal Facility.
4) State BEP – State Bond Expenditure Plan site.
5) LUST – Leaking Underground Storage Tank site.

and in all living things. Some research suggests that EMF pose some risk to human and animal health, while other studies indicate that these fields do not have any adverse health effects. This section briefly describes the potential long-term health effects of EMF, possible avoidance techniques, the regulatory setting, and the electrical system of BART.

Potential Long-Term Public Health Effects from EMF

Although shocks associated with electric and magnetic fields are well understood and largely controllable, concerns about long-term public health effects from exposure to EMF did not surface until the 1970s. The conventional wisdom was that low-level, non-ionizing EMF (that is, EMF lacking sufficient strength to strip ions away from atoms) posed no threat to human health, because the low power of these fields could not break chemical bonds or cause significant tissue heating. However, cancer clusters were reported in residences and schools near electrical substations and transmission lines, and epidemiological studies were published showing a weak, yet potential, association between exposure to EMF and various forms of cancer.

Since 1980, researchers have published numerous papers on the possible health effects of low-level, non-ionizing EMF. The bulk of the research has focused on the health effects of EMF from AC transmission lines greater than 100 kV (kilovolts). However, these and other studies help to illuminate the potential

health effects of EMF from other sources, such as the 34.5 kV AC and 1 kV DC transmission lines required for the BART extension.

AC Transmission. Often, the results of studies which examine the biological effects of EMF are contradictory and dependent on a variety of factors. Scientific opinion varies greatly regarding the potential health effects of non-ionizing EMF. Although the majority of experts on the subject agree that low-level, non-ionizing EMF do have some biological effects (Hileman, 1993), they disagree as to whether such fields can cause adverse health effects.

Perhaps the most influential studies to arouse public concern about EMF have been human epidemiological studies. About ten studies have explored the association between childhood cancer and exposure to 50 Hz (Hertz) or 60 Hz fields (see Hileman in *Chemical and Engineering News,* 1993). The first, conducted in 1979 by Dr. Nancy Wertheimer and Dr. Ed Leeper, suggested that children living near high current lines might be more susceptible to leukemia than those living near low current lines. Since then, three published studies have found no relationship between leukemia and exposure to magnetic fields, and six have reported a positive association. In general, the results of human epidemiological studies are far from conclusive, since researchers have been unable to duplicate many results.

DC Transmission. DC transmission lines are much less common than AC transmission lines. Consequently, far fewer studies have been conducted on the effects of DC power. Research findings done on the health effects of DC fields appear more consistent than findings on AC fields. For example, a study by the Minnesota Environmental Quality Board found that a dairy cattle's proximity to a ±400 kV DC[3] line did not affect milk production or reproductive traits (Martin *et al.*, 1986). In addition, the Minnesota Science Advisory Committee determined that there was little likelihood of either acute or chronic health effects from DC fields (Bailey *et al.*, 1982, 1986). In California, a health survey of residents near the ±400 kV DC Celilo-Sylmar line did not reveal any adverse health effects attributable to the line (Nolfi and Haupt, 1982).

The evidence gathered thus far suggests that EMF do affect human tissues and cells, but there are no conclusive investigations documenting an adverse public or occupational health impact. Because there is an unproven yet potential threat to humans, researchers have recommended a practice of "prudent avoidance" for people concerned about these hazards. Prudent avoidance means limiting exposure when possible, by increasing the distance, for example, between receptors and sources of EMF.

Regulatory Setting

There are no national standards or regulations limiting exposure to EMF. However, the National Electrical Safety Code specifies that the distance between powerline conductors and the nearest house or building must meet safety requirements (electric shock). That limitation indirectly results in upper limits on EMF for transmission lines. Some states and local jurisdictions have passed laws and ordinances limiting EMF exposure. Most of these restrictions apply to electric fields and establish minimum distances between development and specific voltages or maximum kilovolts/meter (kV/m). These standards vary by jurisdiction (e.g., at the edge of a right-of-way, 1.0 kV/m in Montana, 2 kV/m in Florida, and 3 kV/m in New Jersey), reflecting the fact that the scientific community has yet to conclude that a given level of EMF exposure is harmful to human health.

3 The voltage from a DC line is usually referenced at ±, indicating the voltage from each pole (conductor) to ground. However, a DC line can also be referenced by the voltage difference between the positive and negative poles. For instance, a ±400 kV DC line can also be called an 800 kV DC line.

At least two states and two cities are known to have enacted magnetic field strength standards (the city standards are merely advisory). These standards apply to alternating current only, not direct current. Like the electric field standards described above, magnetic field strength standards vary substantially–from a maximum 150 milligauss (mG) at property boundaries in Florida, to a limit of 2.5 mG at school sites in Montecito, California.

BART Electrical System

BART receives AC power from Pacific Gas & Electric (PG&E) for traction power to propel trains. This power is distributed via two sets of parallel 34.5 kV transmission lines and circuit breakers to traction power substations throughout the entire system, where the power is reduced and converted to 1,000 volts direct current (VDC). DC main and feeder circuit breakers then connect the 1,000 VDC to contact rails serving each vehicle in a train. For train control and station facilities, BART also receives from PG&E an additional 12 kV AC power, which it reduces to 480 V. Both the AC and DC voltages associated with the BART system are much lower than those typical of utility transmission lines, which normally carry between 115 kV and 765 kV.

Magnetic field measurements have been taken at traction power substations (Enertech, 1990, 1991) and on BART trains. These measurements indicate that:

- the 60 Hz AC magnetic field from a typical substation generally drops to ambient levels 14 feet outside the fence of the substations;
- the DC magnetic field from the BART Lafayette Substation, measured at the fence line, is generally the same order of magnitude as the local magnetic field of the earth, which is about 400-500 mG; and
- the DC magnetic field aboard trains varies up to four times greater than the earth's magnetic field.

At this time, definitive standards and limits have not been established for exposure to EMF on electrified transit systems. However, potential EMF levels are being considered in the design of BART substations and in procurement of new cars in order to reduce potential EMF exposure.

11.3 Impact Assessment and Mitigation

Significance Criteria and Methodology

Significance Criteria. A public health or safety impact would occur if a project created a potential project-specific or cumulative public health hazard or involved the use, production, or disposal of materials which pose a hazard to people, or to animal or plant populations. The significance criteria for hazardous materials and EMF are identified below.

- **Hazardous Materials.** The Aerial Design Option LPA would be considered to have a significant impact if it exposed the general public to hazardous materials, as defined by the California Health and Safety Code (defined earlier under "Existing Conditions").
- **Electromagnetic Fields.** As discussed earlier, scientific opinion varies greatly regarding the potential health effects of EMF. Nonetheless, some regulatory agencies have adopted a conservative approach and established standards limiting exposure to EMF. Although it may be appropriate for regulatory agencies to adopt standards at this stage of understanding, establishing such criteria for the purpose of evaluating the impacts of EMF would be speculative. This conclusion is supported by Section 15145 of the CEQA Guidelines which states that, if after

thorough investigation, a lead agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact. Pursuant to this section, the assessment of impacts from EMF is limited to a qualitative discussion and relies on the information generated for the BART Lafayette Substation from 1990 and 1991.

Methodology. The potential for adverse impacts from hazardous materials was evaluated in part by determining those instances for which a route or pathway, tracing human exposure to hazardous materials to a particular source, could be reasonably construed. A complete exposure pathway requires that there be a source of contamination, a receptor, a means of transporting hazardous materials from a source to a receptor, and a means of exposure such as direct contact or inhalation. Without a complete pathway, there is no potential for adverse public health impacts.

In order to identify facilities or locations within the project corridor that could be of concern for future BART activities in the area, the following data collection tasks were performed for incorporation into the Hazardous Materials Technical Report:

- forwarded to BART a copy of an American Society for Testing and Materials transaction screening questionnaire, a form requesting information about potential hazardous contamination in the project corridor;
- prepared a transaction screen questionnaire based on field observations during the site visit to supplement information received from BART;
- reviewed state and federal database lists of known hazardous waste sites;
- conducted a physical walk-through and visual inspection of the site and documented adjacent properties of concern with photographs;
- conducted an offsite visual inspection of adjacent and potentially significant nearby sites identified from the CERCLIS, RCRA TSD, State Landfills, and LUST database list searches; and
- reviewed Sanborn historical fire insurance maps for the project corridor.

Based on the results of these tasks, a priority list was compiled of known and suspected hazardous sites. The sites will require further investigation during a Phase I investigation of the Aerial Design Option LPA to determine the nature and extent of potential contamination (Table 3.11-1). The selection of sites for priority listing was based on information obtained during database searches, review of available information, field visits, and site proximity to the project corridor.

Project-Specific Analysis

1. *Hazardous materials used for BART facilities and equipment maintenance would be introduced into the project corridor. However, because of the minimal volumes and concentrations required for these activities, and because BART would comply with applicable federal, state, and local regulations and its own standards, public health and safety would not be affected. (I)*

   Hazardous materials use during operations would be associated with maintenance of the stations, trackway, and vehicles.

   Station maintenance involves the regular cleaning and upkeep of passenger stations and does not involve the use of hazardous materials. However, certain station equipment would contain hazardous materials, particularly oil in elevators and escalators. The amount required would be small and would usually be contained within the equipment. BART would comply with San Mateo County regulations for disposal of waste oil.

Maintenance at the Daly City Shop/Yard would generate oil-contaminated wastes, solvents and paints, and empty aerosol cans which would total four additional 55-gallon drums of waste per month. The wheel truing machine at the yard would generate scrap metal and oil-contaminated water waste. Because BART would manage those wastes according to applicable regulations, they would not pose a significant risk to public health and safety.

As part of trackway maintenance, switch equipment would require heavy greasers which release grease from a 5-gallon reservoir over time. BART would also regularly remove graffiti from operating facilities with paint strippers. The compositions would vary but a caustic stripping compound would typically be used.

Finally, vehicle maintenance would involve a car wash that sprays a mild cleaning compound on the cars and then rinses it off. If cleaning compounds used by BART are listed as hazardous materials, BART would be subject to applicable storage and disposal regulations, including CCR Title 26. (The uncertainty regarding the classification of these compounds is due to the fact that their composition varies [Jensen, 1993]). The vehicle washing system would be designed to recycle its wash water supply and would, therefore, generate a negligible amount of potentially hazardous wastewater (see discussion in Section 3.5, Community Services and Facilities, for the anticipated wastewater volumes). Several 55 gallon drums of concentrated cleaning compound might be stored at the facility at any one time. A typical cleaning compound would be a 1 percent solution of oxalic acid, which is not listed as hazardous under any federal regulatory statute. It is, however, listed in CCR Title 22 as a hazardous material due to toxicity and would be managed accordingly by BART. BART would be subject to RWQCB standards for discharge of car wash water and to the requirements of an NPDES permit, so that the impact of any increase in hazardous waste generation resulting from vehicle maintenance activities should be insignificant. Monitoring would be required as a condition of the NPDES permit, further ensuring avoidance of a significant impact.

Overall, the materials described above are potentially hazardous, but do not pose a significant public health and safety risk because of the minimal volumes and concentrations required and because BART will meet legal requirements for handling and disposal practices.

2. *By the time BART operations commence in the project corridor sites of contamination identified during the Phase I and II hazardous materials site investigations would be remediated or mitigated to an acceptable level, as defined by responsible regulatory agencies, to protect public health and safety. Therefore, the risk of exposure to hazardous materials during BART operations would be insignificant. (I)*

As part of its standard operating procedures, BART would undertake site assessment and characterization prior to construction. If hazardous materials contamination were identified during construction of the project, BART would be required to remediate or mitigate to an acceptable level, as defined by responsible regulatory agencies. This measure reduces the risk of exposure to hazardous materials during BART operations to an insignificant level.

3. *BART employees, passengers and land uses near the alignment would be exposed to EMF generated by BART facilities. The long-term exposure is expected to be minimal because of the distance to and shielding of EMF sources. The effects of this exposure are not known at this time.*

Key sources of EMF for the Aerial Design Option LPA include the PG&E substation proposed on Shaw Road and six to seven proposed traction power substations. The distance from the nearest

residence to any proposed location is about 25 feet. Measurements at an existing substation indicate magnetic fields typically return to ambient levels within 14 feet of the substation. Nevertheless, the effects of low-level exposure are inconclusive and speculative. Nonetheless, BART would ensure that prudent avoidance measures to minimize exposure to EMF are implemented where applicable.

The electrical power serving BART is of relatively low voltage compared to that for which EMF effects have been studied. Power could be drawn from three potential PG&E sources: the existing Airport Substation, the existing Millbrae Substation, or a proposed substation in the northwest quadrant of Highway 101 and I-380 on Shaw Road. As the Airport and Millbrae Substations are already in operation, there would be no additional EMF impacts due to BART's electrical demand. A substation at Shaw Road would introduce a new source of EMF; land surrounding the proposed site is used exclusively for industrial purposes and contains no sensitive receptors, and therefore no impacts associated with the new station will occur.

The existing PG&E tower on Mission Road near the southern end of Hickey Station would be modified, and an overhead transmission line would be relocated. The line would pass within 150 feet of homes and adjacent to a clinic, but its voltage (12/4 kV) is far below that of lines for which EMF have been a concern (>115 kV). Accordingly, adverse public health effects from the relocation/installation of these facilities are not expected.

Other BART transmission lines between the PG&E substations and the appropriate BART traction power substation would be placed underground and in galvanized-steel conduit at proposed facilities. This configuration would shield most, if not all, of the electric fields from transmission lines. Any electric fields which penetrated these shields would be greatly reduced or completely blocked by other physical barriers, such as vegetation and structures (e.g., the typical home provides 90 percent shielding from electrical fields). As part of the project, BART would provide landscaping with mature trees at heights of 10 to 20 feet around all traction power substations. As a result, health effects from electrical fields would not be expected.

Because homes and other physical barriers would not shield people from the magnetic component of EMF, the public would be exposed to magnetic fields. Sources of magnetic fields under the proposed project would include six to seven traction power substations. Measurements of AC magnetic fields at an Upper Happy Valley BART Substation, which is similar to the traction power substations proposed for the BART extension, indicated magnetic fields ranging between 0.3 and 13.0 mG at the fence perimeter, with an average of about 4 mG. This level of exposure is typical of the field strengths 12 inches from common household appliances, such as microwave ovens, hair dryers, and television sets. The AC magnetic field from a BART substation would generally drop to ambient levels 14 feet outside the fence perimeter. Based on a review of the conceptual plans and profiles, the nearest residence to any of the traction power substations is about 60 feet away. DC magnetic fields at the fence perimeter of the Upper Happy Valley BART Substation typically averaged near ambient levels, between 400 and 500 mG, but rose to as high as 4,900 mG for two to five seconds during the passing of trains.

Whether AC and DC magnetic field strengths in these ranges affect human health has not been determined. No known studies have suggested that adverse health effects result at these levels. DC magnetic fields on BART trains routinely register between 1,600 and 2,000 mG. AC magnetic field measurements on BART trains have not been conducted. The exposure of the general public to

these field strengths is limited to short-term journeys on BART, but train operators would be exposed to these levels for extended periods on a daily basis. No standards have been established limiting exposure to EMF onboard electric trains in the U.S. Whether BART passengers and train operators would experience adverse health effects is not known at this time. Due to this uncertainty, it would be speculative to evaluate the significance of EMF impacts from the BART extension.

While evidence regarding risks associated with exposure to EMF are inconclusive at this time, EMF levels are being considered in the design of BART substations and in procurement of new cars. The project design will incorporate measures to reduce potential EMF exposure, including orienting electrical wiring to maximize EMF cancellation; placing electrical wiring in galvanized-steel conduits to prevent escape of electrical fields; and locating potentially higher field-emitting components as far as possible from sensitive receptors, such as schools and residences.

Cumulative Analysis

Projects with a potential to cumulatively impact public health and safety in conjunction with the BART–San Francisco Airport Extension include the SFIA Master Plan, the *El Camino Corridor Redevelopment Plan*, new industrial activities in areas near the project corridor, and general growth projected in ABAG's *Projections '94*. The SFIA Master Plan Final EIR identifies hazardous materials use and generation, and potential long- and short-term contamination of soil and groundwater associated with proposed SFIA development. Environmental documentation for the *El Camino Corridor Redevelopment Plan* identifies no health and safety issues. New industrial activities in South San Francisco and San Bruno, the most likely locations for industrial development in the vicinity of the project corridor, could potentially involve the use, transport, storage, and generation of hazardous materials. However, the presence of the BART system and ancillary facilities would not add to the transport or generation of hazardous materials. The amount of hazardous material used and stored in the BART system, together with amounts used and stored for other industrial activities, would be negligible.

Cumulative projects would also introduce new sources of EMF into the project corridor. As noted earlier, the effects of exposure to EMF are not well understood. However, the same prudent avoidance measures described for the proposed project to minimize exposure to EMF also apply to these projects.

Section 12
Energy

12.1 Introduction

Operation of the proposed BART extension would require energy for traction power (energy required to propel BART vehicles), station operation, and maintenance. This analysis describes and evaluates the use of nonrenewable energy sources and determines whether the Aerial Design Option LPA would substantially increase the use of nonrenewable energy or use energy in a wasteful manner. Impacts addressed in this section are those associated with operation of the Aerial Design Option LPA. Impacts directly related to construction activities are addressed later in Section 3.13, Construction.

12.2 Existing Conditions

Supply

Electricity in the project corridor is supplied by PG&E. PG&E, serving northern and central California, relies on a variety of primary energy sources to meet electricity demands. The main power-generating systems, including electric-generating stations, receiving and switching stations, and transmission lines, are located within the PG&E service area. Table 3.12-1 shows sources and volumes of electricity produced by PG&E in 1990.

Table 3.12-1
Sources of Energy Supplied by PG&E in 1990

Source of Electricity	Kilowatt Hours (kWh)	British Thermal Units (Btu) (in millions)
Hydroelectric Plants	8,008	82
Fossil Fuel Plants	24,496	251
Geothermal Plants	7,324	75
Nuclear Plants	16,274	166
Non-PG&E Sources	46,682	478
Total Gross System Output	102,784	1,050

Source: Pacific Gas & Electric Company, 1990.
Note: Electrical power will be supplied from the regional electrical grid system, which produces its electricity from hydroelectric, nuclear, coal, gas, petroleum, and other sources. According to PG&E, the production of 1 kWh of electricity requires the expenditure of approximately 10,500 Btu.

Demand

Oil supplies about 57 percent of California's energy requirements. While industry as a whole depends on oil for about one-third of its energy needs, transportation depends on this primary energy for almost 100 percent of its requirement.

California's transportation system is the largest consumer of energy in the state, accounting for about half of the total energy consumed. In the year 2004, on-road vehicles are projected to represent approximately 80 percent of California's transportation energy demand, a 10 percent increase from current demand. Cars, trucks, and buses account for nearly all motor vehicle fuel consumption, most of which is gasoline.

California's transportation activity is expanding faster than its population, and the rate of improvement in vehicle fuel economy has slowed. Strategies to address demand for petroleum fuels for transportation purposes include improved fuel economy, increased use of alternative fuels and modes of transportation, and changes in land use patterns.

12.3 Impact Assessment and Mitigation

Significance Criteria and Methodology

Significance Criteria. Implementation of the project would have a significant project-specific or cumulative energy effect if it encouraged activities that resulted in the demand for amounts of fuel or energy that adversely affected PG&E's ability to serve its customers, or if the project used fuel or energy in a wasteful manner. If the project alternatives resulted in a net energy savings, the energy effect would be considered beneficial.

Methodology. Methods used to calculate energy demand for the BART extension are described below.

- **Stations.** Energy is required for the operation of each BART station, including automated ticket machines and lighting for parking lots and walkways. The annual energy requirements to power a BART station, derived from BART, are based on data from existing stations and are comparable to proposed stations. It is estimated that at-grade stations use 12,480 kWh per month; aerial stations, 7,200 kWh per month; underground stations, 19,500 kWh per month; and intermodal stations, 26,600 kWh per month.
- **Maintenance.** Maintenance energy for a rail system is the energy required to repair and maintain vehicles and associated equipment. Based on BART estimates, 7,060 Btu per vehicle mile is required for maintenance. Estimates for maintenance energy are derived by multiplying three factors: the length of the alignment; the number of daily VMT by BART cars (according to the proposed BART operating plan); and the amount of Btu utilized per vehicle mile (7,060). The maintenance of all BART stations is included in this calculation.
- **Propulsion.** Vehicle propulsion is the primary use of energy by BART. The propulsion, or traction power, requirement (in Btu) is a function of the number of miles traveled per BART vehicle, the total number of vehicles, and the energy consumption per mile. The first two factors are derived from BART's current operations and yield an estimate of 12,335 vehicle miles traveled daily. The third factor, energy consumption mile of 4.9 kWh is derived from the BART Warm Spring Extension Draft EIR (1993) and account transmission/line losses and thermal power plant inefficiencies.

The current number of miles traveled, derived from the BART operating plan, is estimated to be approximately 12,335 daily. The thermal energy (in Btu) required to provide traction power per VMT was obtained by multiplying the average energy traction estimate (4.9 kWh/VMT, based on the *BART*

Warm Springs Extension Draft EIR, 1993) by 3,413 Btu per kWh; this figure accounts for transmission/line losses and thermal power plant inefficiencies.

Project-Specific Analysis

1. *BART service under the Aerial Design Option LPA would require 560.37 million Btu per day to operate. (I)*

   The total electricity demand for the *Aerial Design Option* LPA of 560.37 million Btu per day includes 6.67 million Btu per day to operate one aerial one at-grade, and two underground stations; 164.36 million Btu per day for maintenance; and 389.34 million Btu per day to operate the traction power substations.

   BART would receive power from any of three possible PG&E substations. These include the existing Airport Substation, the Millbrae Substation, or a proposed substation located in the vicinity of the I-380 and Highway 101 interchange on Shaw Road. The decision regarding which substation would serve BART depends on negotiations between PG&E and BART.

   Typically, PG&E would use the substation nearest a BART traction power substation to serve BART. PG&E would determine the most economical and least environmentally damaging route for the feederline to a BART traction power substation. The facilities required to serve BART with 34.5 kV power include a 50 megavolts-amperes (MVA), 115/34.5 kV transformer installed in the PG&E substation, and an underground 34.5 kV feeder to one of the BART traction power substations. From this first traction power substation, BART would distribute the 34.5 kV power to the other traction power substations along the BART alignment. The underground feeder line from the PG&E substation to the BART extension would be routed mainly through city streets.

   PG&E would accommodate BART energy requirements without affecting the company's ability to supply electricity to its customers (CEC, 1991), and no significant adverse impacts are expected.

2. *BART use would replace less energy-efficient automobile trips, resulting in a net energy savings (see Table 3.12-3). (B)*

Cumulative Analysis

The Aerial Design Option LPA, in conjunction with future growth in the Bay Area, including the SFIA expansion, the *El Camino Corridor Redevelopment Plan,* and other development (all of which are included in ABAG's *Projections '94* forecasts) would increase electricity demand from PG&E. This cumulative demand is not expected to be significant, since PG&E has planned for, and expects to meet, future energy needs (CEC, 1991).

Future transportation energy demands, including the BART–San Francisco Airport Extension, have been estimated by MTC based on regional VMT forecasts for the year 2010. In 1993, the average fuel usage per VMT for motor vehicles was 0.043 gallons (5,375 Btu). By the year 2010, this figure will be reduced to 4,279 Btu per VMT because of increased fuel efficiencies. Fuel efficiency values estimated for the year 2010 are presented in Table 3.12-2. The total propulsion energy requirements of motor vehicles (average fuel usage per VMT multiplied by projected VMT) are presented in Table 3.12-3.

Table 3.12-2
Year 2010 Fuel Efficiency Assumptions

Fleet Mix	Fleet (%)	Fuel Consumption (gal/VMT)	Energy Factor (Btu/VMT)
Light-duty autos	70	0.034	4,250
Light-duty trucks	17	0.045	5,625
Medium-duty trucks	5	0.084	10,500
Heavy-duty trucks (gasoline)	3	0.176	22,000
Heavy-duty trucks (diesel)	1	0.151	21,140
Motorcycles	4	0.020	2,500

Sources: Fuel consumption factors from California Air Resources Board.
Year 2010 EMFAC7 factors/Burden 7F Activity, 1993.

Notes: 125,000 Btu/gallon of gasoline
140,000 Btu/gallon of diesel fuel

Table 3.12-3
Total Daily Energy Consumption for Motor Vehicles (in Btu)

Fleet Mix	Proposed Project	No Build	TSM
Light-duty autos	458,263,311,598	458,874,206,029	460,326,360,417
Light-duty trucks	147,288,976,967	147,485,322,634	147,952,055,032
Medium-duty trucks	80,230,120,723	80,337,072,628	80,591,307,516
Heavy -duty trucks (gasoline)	100,843,019,589	100,977,449,811	101,297,003,286
Heavy-duty trucks (diesel)	32,378,147,309	32,421,309,459	32,523,910,011
Motorcycles	15,464,646,458	15,485,261,825	15,534,266,521
Total Btu	834,468,222,644	835,580,622,386	838,224,902,783

Sources: Year 2010 EMFAC7 factors/Burden 7F Activity, 1993. Congressional Budget Office, Urban Transportation Energy, Appendix A, 1977.

Implementation of this alternative would result in a reduction of daily automobile VMT, thereby reducing the daily propulsion energy demand for autos. The daily VMT for BART would increase, but the proposed project would reduce overall propulsion energy requirements for transportation, a beneficial effect.

Section 13
Construction

13.1 Construction Scenario

This section provides a discussion of line construction between Colma and Millbrae, aerial construction across SFIA property, construction of four stations, and various other aspects of the construction process. Construction techniques proposed for the BART–San Francisco Airport Extension are described. Construction features and estimated quantities are provided, along with the anticipated construction schedule. Information on the construction scenario is summarized from the *SFO Airport Extension Preliminary Construction Scenario Report*, dated November 1993 and May 1995, and the *Construction Scenario Report for Alternative VI Aerial Wye-Stub Design Option*, dated August 1995, prepared by the Bay Area Transit Consultants. The types of impacts addressed in this section are primarily short-term in nature and directly related to construction activities during the construction period.

The Aerial Design Option LPA alignment would run from the end of the existing tailtracks in Colma through San Bruno in a cut-and-cover configuration before rising east across SFIA property in an aerial configuration. Although no formal agreement has been reached, BART and the SFIA contemplate that, to the extent legally permitted, the SFIA will design and construct the portion of the BART project east of the western edge of Highway 101, including the highway overpasses, the station at the planned International Terminal, and support structures.

While this section presents the most current information available regarding construction methods, activities, and duration, specific construction practices will vary with work area accessibility, soil conditions, proximity of adjacent structures, extent of utilities relocation, traffic control requirements, and permissible noise levels (among other requirements). BART, in conjunction with the design/build contractor, will discuss the construction scenario details with each city and negotiate appropriate methods to minimize impacts.

Preconstruction Activities

Geotechnical Activities. Geotechnical field investigations to assess soil conditions are necessary to develop preliminary engineering designs. The field investigations would consist of exploratory soil borings and cone penetrometer tests. Proposed test sites would be located primarily along the CalTrain track. The number of the test locations would be minimized to the greatest extent possible and sited to avoid wetlands along the project corridor.

Clearing of Vegetation and SFGS from Construction Sites. It will be necessary to clear woody vegetation and exclude and remove the SFGS from the alignment right-of-way between Colma and Millbrae prior to initiating construction of the mainline. Woody vegetation would be cleared from a 70-to 100-foot-wide corridor across SFIA property west of Highway 101 prior to initiating construction of the aerial wye-stubs. To assist in the trapping and removal of endangered SFGS from proposed construction sites, temporary exclusionary fencing would surround the construction site prior to vegetation clearing activities. For further details concerning exclusion of SFGS from the construction site, please refer to the Biological Resources discussion in this section.

Heavy equipment with special low-pressure tires or tracks would be used in the clearing and grubbing of woody vegetation within the construction corridor to prevent compaction of wetland soils. The vegetation clearing activities are expected to be completed within a period of approximately three months.

Construction Activities

The BART line is proposed to be constructed at grade, below grade, and in an aerial configuration. Chapter 2 provides a description of the location of each type of line construction; plans and profiles can be found in Volume IV of this FEIR/FEIS. Construction techniques commonly associated with these methods are discussed below.

At-Grade Line Sections

Typical activities for at-grade construction include demolition, tree and shrub removal, clearing and grubbing, and relocation of existing structures, facilities, utilities, roads, tracks, and fences; excavation and grading for foundations; construction of track subgrade; and placement of sub-ballast and trackwork materials. Generally, each of the activities of at-grade line construction can be expected to progress 500 feet per week.

Below-Grade Line Sections

Below-grade line sections may be constructed in a cut-and-cover subway configuration (enclosed, reinforced-concrete box, below grade), retained cut (a "U-shaped" reinforced-concrete structure that is open at the top and partially or entirely below grade, with an above-grade security fence or sound wall), or a subway tunnel. These construction options are discussed below.

Cut-and-Cover Subway Section. A typical cut-and-cover box section is 10 feet below the surface, in order to accommodate utilities and landscaping. In areas of minimum right-of-way width (less than 80 feet), shoring of excavated areas would extend to the ground surface to provide sufficient work area on each side of the box. In areas of wider construction easements, open excavation with 1-to-1 slopes (45 degrees) could be excavated to the top of the box, with an excavation width of about 50 feet and a shoring system placed to the height of the box.

Following excavation and shoring operations, the line section subgrade would be compacted and graded, and underground subdrains, duct banks, and other utilities installed. This process would be followed by placing concrete for the bottom slab foundation. Frequent concrete pours (every two to five days) of 60 to 600 cubic yards or more (six to 60 ready-mix truck loads) can be expected as work proceeds.

The shoring system may be able to serve as the outside form for the concrete box. Panels would be nailed to the shoring system, if required, to waterproof the walls. Rebars would be placed and concrete poured for the sides and roof of the box. Waterproofing would be provided over the roof of the subway structure and a concrete mix poured on top to protect the waterproofing during backfill. The roof and sides of the box would cure for approximately three to seven days (concrete must reach 70 percent of design strength) before the traveling forms are collapsed and moved ahead to the next sections. The box can be backfilled after the section has reached 90 percent of full design strength (28 days). The construction rate for each activity of shallow cut-and-cover subway section is approximately 100 feet per week.

Retained Cut Section. It is expected that nearly all proposed retained cut line sections would be U-shaped concrete structures placed approximately 20 feet below ground. Construction of this type of structure is similar to that of subway lines, except there is no top slab and the forms are easier to fabricate and handle. For shallow depths, open cut instead of shoring would be utilized. Generally, retained cut sections require more utility relocation work than cut-and-cover sections, because utilities cannot be suspended above the cut-and-cover box during construction. Utilities spanning retained cut segments would have to be rebuilt or relocated in most cases.

Excavation Support System. An excavation support system must be installed for cut-and-cover and retained cut construction methods to temporarily support the excavated earth surfaces while the permanent concrete subway box is constructed. Of the many available systems, two are recommended for the soil conditions in the project corridor:

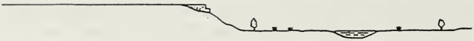
- **Internal Bracing.** This method is feasible where the excavation is deeper than the groundwater table or where right-of-way is not available for tiebacks. Either sheet piles or H piles with timber lagging between are installed on the excavation lines. Transverse steel struts are installed as the excavation proceeds to prevent the walls from moving into the empty space. When the full depth is reached, a concrete base slab is poured to stabilize the bottom. The struts are removed as the permanent concrete subway box is installed. The temporary piles are removed and the volume above the permanent box is backfilled.

- **Tiebacks.** This method is feasible where subsurface easements extend out at least 40 feet from the face of the excavation. In this case, steel H piles and lagging are supported by steel rods installed and anchored in holes drilled into undisturbed soil outside the excavation. The subsurface construction easements required for these tiebacks will not interfere with any facilities or uses on the surface. Soil nailing is another type of tieback system. Tieback systems are widely used to eliminate the traverse struts of the internal bracing system which interfere with the excavation operation.

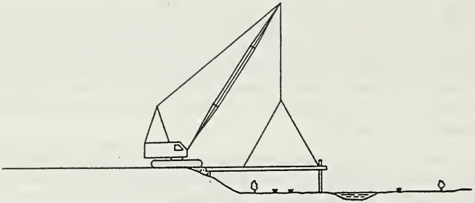
Aerial Construction

Aerial-Wye Construction. After removing and excluding the SFGS and clearing and grubbing vegetation, BART would commence construction. BART would construct a temporary trestle bridge to allow construction of the aerial wye-structure with minimal surface disturbance. This would increase the construction schedule by approximately six months. Two temporary trestles, approximately 40 feet wide each, would be constructed parallel to the footprint of the aerial tracks. The temporary trestles would be supported on pilings driven into the soil and elevated above the ground surfaces to allow for unimpeded movement of water and wildlife while the trestles are in place. A platform would be installed on the pilings for the heavy equipment. The temporary exclusionary fencing would be removed after the trestles were constructed to allow movement of the SFGS. The construction trestle would remain in place up to 18 months during construction. Figure 3.13-1 illustrates the sequence of the temporary trestle construction.

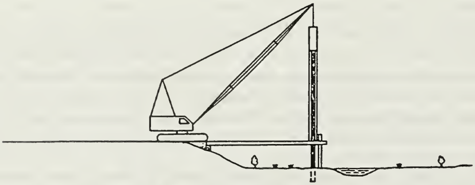
Construction of the BART aerial structure and its support columns would commence from the westerly side of the aerial portion adjacent to the existing CalTrain tracks and proceed easterly across the SFIA property between the existing tracks and Highway 101. All excavated material would be removed and disposed offsite. The aerial structure would be supported by specially designed support columns or pillars spaced approximately 80 feet apart, with caisson foundations supporting the columns. The



Step 1: Construct Launching Ramp



Step 2: Place Pile Template



Step 3: Drive Temporary Trestle Support Piles

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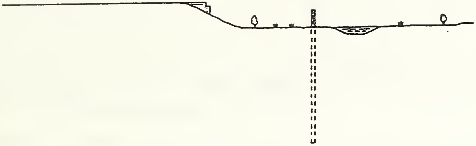
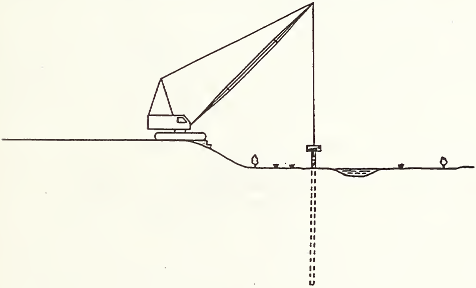
Construction Sequence for Temporary Trestle Structure

FIGURE 3.13-1



Step 4: Remove Pile Template



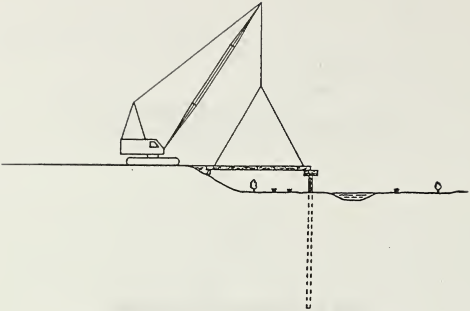
Step 5: Place Temporary Trestle Pile Cap

OGDEN

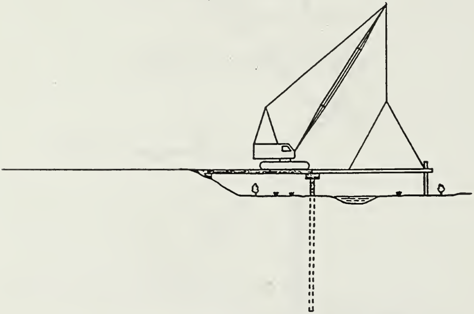
Construction Sequence for Temporary Trestle Structure

FIGURE

3.13-1



Step 6: Place Temporary Trestle Girders



Step 7: Move on to Temporary Trestle Span
and Repeat Steps 2 through 6

OGDEN

Construction Sequence for Temporary Trestle Structure

FIGURE 3.13-1

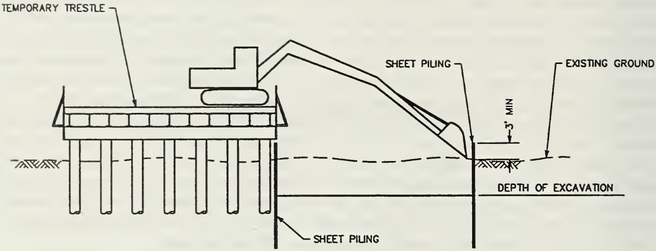
concrete caps on top of the caissons and below the columns would be constructed below the existing ground surface.

After the erection of the foundations and support columns, the aerial structure girders would be set in place. Girders would be prefabricated at the contractor's laydown area and rolled to their location on special dollies designed for use on the temporary trestle. Cranes located on the construction trestle would lift the girders from the dollies and fix them in place upon the columns. Optional techniques for installing girders may include precast, segmented concrete construction in this area or cast-in-place concrete girders with formwork supported entirely from columns resting on the concrete caps at each aerial structure column. This formwork would span the entire area between each aerial structure column. Figure 3.13-2 illustrates the sequence of operations during the aerial structure construction. The height of equipment used during construction of the aerial structure is within the height limitations set by the Federal Aviation Administration (FAA) for safety consideration.

Aerial Structure over Highway 101. The aerial portion within the Highway 101 right-of-way would be constructed in a traditional fashion, concurrent with the construction of new highway ramps into and out of the SFIA, as called for by the SFIA Master Plan. The traffic lanes adjacent to column locations would be redirected slightly, to allow working space at column footing locations, with temporary concrete barriers (K-rail) and temporary traffic lane restriping. Caissons for the columns would be installed and covered at their tops with a concrete cap located below the existing surface of the highway. After columns are constructed, prefabricated structural girders would be lifted to the tops of the columns and secured. The BART deck would then be built on top of the girders, followed by the trackwork, traction power, train control, and communication facilities. The number of lanes in each direction would be maintained, except during the actual placement of the prefabricated girders. The placement of girders spanning the northbound lanes would require that those lanes be diverted for two nights between the hours of 11:30 P.M. and 4:30 A.M. A similar diversion would take place over the southbound lanes. The construction rate for aerial line segments is approximately 100 feet per week.

Aerial Structure in the San Francisco International Airport. The remainder of the aerial wye-stub would be located on SFIA property and would be built using conventional construction techniques. The aerial track line sections consist of reinforced, precast concrete or steel girders installed on cast-in-place, reinforced-concrete columns. Column footings would be drilled caissons and/or drilled and driven piles, depending on soil and structural considerations. Approximately four caissons, 3 feet in diameter, would be drilled 50 to 90 feet deep for each column. After the caissons are drilled and rebars placed, concrete would be placed into the drilled hole. The footing caps would be formed, rebars placed, and concrete poured. The column rebar cages would be prefabricated onsite and placed on the footing caps by a large crane. The column forms would be placed around the rebar cage, and the column poured in place and allowed to cure.

Precast, prestressed, reinforced-concrete girders would be fabricated and delivered to the project site. Because of the weight and length of the girders, special tractors and trailers with approximately 13 axles and 90 wheels would be necessary to transport the girders (total weight approximately 353,100 pounds). The girders would be approximately 4 feet deep, 12 feet wide, up to 98 feet long, and weigh approximately 175 tons. For a standard aerial structure section, two girders are placed on each bent (one on the inbound and the other on the outbound track section) by large cranes. Permits are generally required to transport the girders to the project site.



Step 1: Install Sheet Piling and Excavate for Footing

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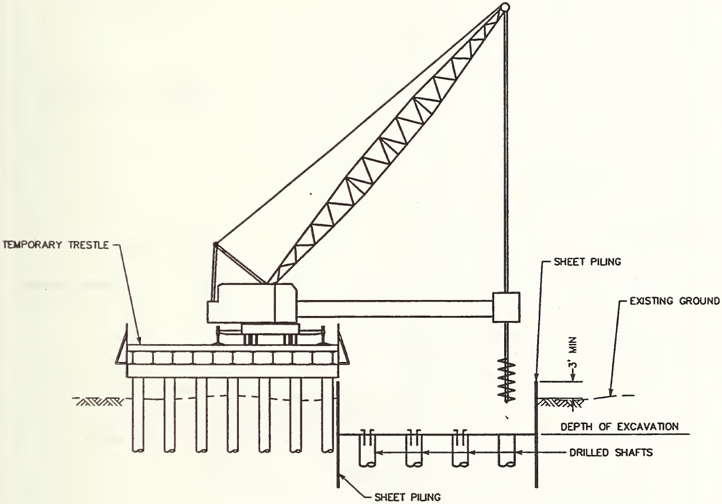
Construction Sequence for Aerial Structures

FIGURE 3.13-2



Step 2: Install Drilled Shafts

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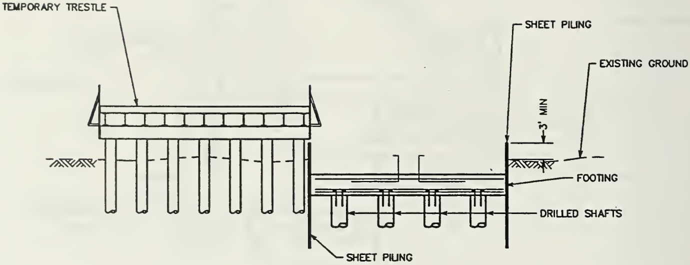
Construction Sequence for Aerial Structures

FIGURE 3.13-2



Step 3: Construct Footing

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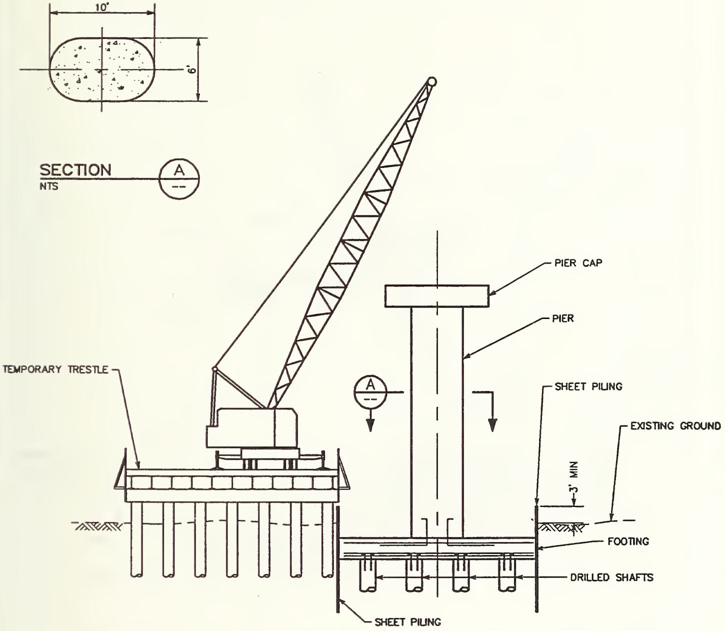
Construction Sequence for Aerial Structures

FIGURE

3.13-2



Step 4: Construct Pier and Structural Steel Pier Cap

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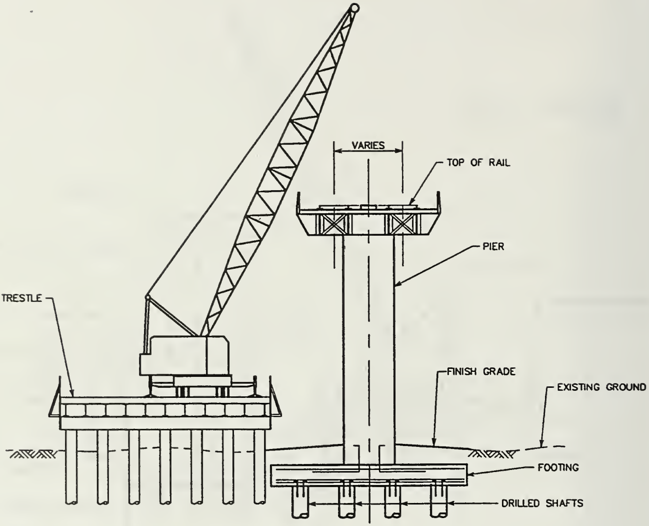
Construction Sequence for Aerial Structures

FIGURE 3.13-2



Step 5: Construct Superstructure and Install Rails, Traction Power, Control and Communication Systems

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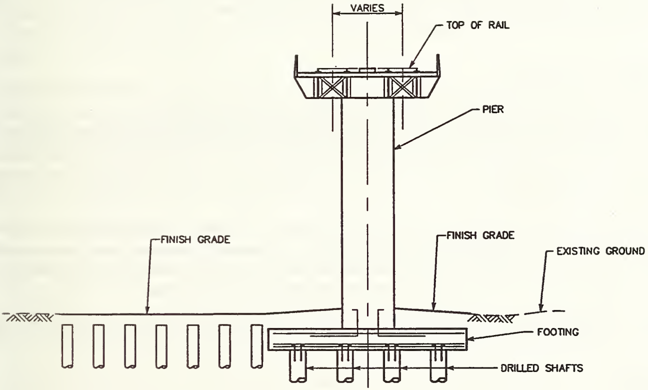
Construction Sequence for Aerial Structures

FIGURE 3.13-2



Step 6: Remove Trestle and Restore Site

OGDEN

Construction Sequence for Aerial Structures

FIGURE 3.13-2

A closure pour between the girders at the column bents would be formed, rebar placed, and concrete poured. Track drainage facilities would be included in the closure pour. A temporary railing would be required for worker safety during construction, and this railing could be replaced with sound barrier panels. A steel walkway would be installed between the girders, and system conduits installed below the walkway. The construction rate for aerial line segments is approximately 100 feet per week.

Construction of this portion of the Aerial Design Option LPA would be coordinated with construction of SFIA improvements, including the Ground Transportation Center, new access ramps to Highway 101, the Airport International Terminal Station, and the ALRS. BART proposes that the SFIA design and construct the portion of the proposed project located east of the western edge of Highway 101 to ensure that construction does not interfere with or cause delay to proposed SFIA Master Plan projects. This portion of the proposed project includes the highway overpasses, the station at the planned International Terminal, and the trackway and supporting structures.

Station Construction

As with line construction, stations may be constructed below grade, at grade, or in an aerial configuration. Below-grade and at-grade station structures would normally be placed on concrete spread footings, except where subsurface conditions warranted deeper foundations, such as at the Airport Intermodal Station. Aerial stations would be constructed on columns, with drilled concrete caissons or driven-pile foundations similar to aerial line sections.

Station work would begin with site work, excavation, and construction of retaining walls and the station structural shell. Upon completion of this work, track and system work necessary for start-up and testing could be completed simultaneously with remaining station work, including architectural, mechanical, and electrical systems, followed by parking structures, parking lots, and landscaping.

The station and parking structures include foundations, superstructures, and associated architectural, structural, mechanical, and electrical works, and are cast-in-place, reinforced-concrete structures.

Systems

System elements for the proposed BART extension include traction power, train control, communications, and automatic fare collection. Conduits, foundation pads, and other facilities required for system operations would be installed with the line and station. System work is light- to medium-intensity construction, consisting of the installation of sensors, pulling cables switchgear assembly, and transformers.

Traction Power Substations. Traction power facilities are necessary to supply propulsion power to the vehicles. Traction power substations would be located adjacent to the trackway, at stations or midway between stations. Power substation equipment generally consists of an electrical switch assembly, rectifiers, and transformers installed in prefabricated enclosures; this equipment would be shipped to the project site and placed on foundation pads constructed by the line or station contractor.

Train Control. The train control system includes cables and devices installed on the track, in train control bungalows (wayside equipment rooms), and in Central Control facilities to provide automatic train protection, operation, and supervision functions.

Control equipment located on the trackside includes track circuits; switch machines; station stop apparatus and antennae; and wayside signals, signs, ID readers, and other wayside indication apparatus. In the train control bungalows, apparatus include control and data communication circuits signaling modules, logic circuitry, and uninterrupted power supplies. Cable trays and conduits for communication controls are included in the line work.

Communications. The communication element of the project is composed of the systemwide cable network, radio communication system, station communication system, and supervisory control and data acquisition (SCADA) system. The systemwide cable network provides the backbone communication link for voice and data signals from Central Control at the Lake Merritt Station to all remote facilities. The radio system provides voice communications along the BART right-of-way, adjacent roadways, and off-trackway locations. Station communications include public address, closed-circuit television, and telephone systems. SCADA provides remote control and supervision of traction power operation, train control, and other support facilities.

Fare Collection. The automatic fare collection system proposed for the BART extension is the same as the self-service fare payment system in other stations. Generally, automatic fare collection systems are supplied and installed by equipment manufacturers and must be compatible with the existing BART self-service fare payment system.

Possible Mobilization and Laydown Areas

The SPTCo right-of-way is narrow and bordered by private commercial and residential properties. Construction in this right-of-way would generally consist of cut-and-cover subway, retained cut, or aerial line sections that require the transport of construction materials (such as concrete, rebar, soldier piles, wood lagging, form material, and track) and the disposal of excavated materials. Access to the work area from public streets would be required at 500-foot intervals for narrow construction areas of approximately 60 feet in width, or at 1,000- to 2,000-foot intervals for areas with a width of 110 feet or more.

Potential laydown sites for contractor mobilization and material storage, also known as staging areas, have been identified, for each of the following reaches of line work, and are illustrated in the conceptual plans and profiles contained in the Design Appendix in Volume IV of this FEIR/FEIS. The number of laydown sites identified may be greater than the number actually required for project construction. BART would acquire easements for these sites and then allow the contractor to select the specific sites to be used.

Colma Station to Serramonte Boulevard

- **Italian Cemetery Site at El Camino Real and F Street.** This area was used for the construction of the Colma turnback subway box. The access road leading to the top of the subway box could be used to construct the extension of the subway box.

- **South Side of Olivet Parkway.** This site is relatively small, measuring 160 x 140 feet. It could accommodate earth-moving equipment and approximately 8,500 cubic yards of fill material, stockpiled to a height of 12 feet or more.

- **Strip of Land North of Serramonte Boulevard at El Camino Real.** This strip of land could be used for stockpiling fill material, as a detour of Serramonte Boulevard, or as a staging area for cranes, concrete pumps, and other equipment required for concrete work on this section of line.

Serramonte Boulevard to Mission Road

- **South of Guido's Restaurant on El Camino Real.** The site is steep but could be developed into a stockpile and laydown area that would not disrupt either the cemeteries or existing businesses. The site measures 350 x 120 feet and could store approximately 1,000 cubic yards of material. Additionally, this site is midway between Serramonte Boulevard and Mission Road and could serve as a staging area for cranes, concrete pumps, and other equipment in this reach of the line section.

- **Hills of Eternity Memorial Park Site on El Camino Real.** This is a large area suitable for stockpiling materials and as a contractor's laydown area. This site is capable of storing 15,000 cubic yards of material and could be utilized as a staging area for construction equipment required for concrete work on this section of line.

- **Holy Cross Cemetery Site on Mission Road.** This area could be used to detour Mission Road traffic and as an earthwork stockpile area.

Mission Road to Chestnut Avenue

- **Mission Road behind Macy's Warehouse.** This site is proposed for the Hickey Station. It has access to both Mission Road and El Camino Real and could serve as a staging area for construction equipment required to build the Hickey Station and this reach of the line section.

- **City and County of San Francisco (CCSF) Water Department Property.** The former Muni rail corridor adjacent to the alignment could serve as a staging and access area for construction equipment. The undeveloped lot west of Mission Road and south and west of the existing Colma Creek channel could also serve as a staging and access area for construction equipment.

- **Kaiser Medical Center.** The undeveloped property south of the Kaiser Medical Center parking garage, which is east of El Camino Real and west of the CCSF property, could serve as a staging and access area for construction equipment.

Chestnut to South Spruce Avenue

- **CCSF Water Department Property.** Adjacent to the proposed alignment, this former Muni rail corridor could function as a staging and access area for construction equipment.

South Spruce Avenue to Forest Lane

- **CCSF Water Department Property.** This CCSF site is also adjacent to the proposed right-of-way. This area is too small to stockpile excavated materials; however, it could provide access to the site for construction equipment and serve as a staging area for concrete pours. (The remainder could be used as right-of-way for the alignment through the Tanforan Station.)

Forest Lane to Cupid Row

- **I-380 at Forest Lane.** A two-acre staging area would be located under I-380 and across the street at the southeast corner of Forest Lane and Huntington Avenue.

- **Forest Lane to Florida Avenue.** The CCSF Water Department property adjacent to the alignment could serve as a staging and access area for construction equipment. (Portions would also serve as right-of-way for the BART subway box.)

- **San Bruno CalTrain Station.** A six-acre site east of the tracks would be located at the present CalTrain station.

- **San Bruno Laydown Area.** Construction of the BART mainline from Angus Avenue to just north of Center Street, and the aerial structures between the mainline and the west side of Highway 101, would be supported from one of three temporary storage yard and staging area alternatives. Each alternative would be located in the vicinity of Belle Air Elementary School in San Bruno, as shown in Figure 3.13-3.

  Alternative A, located in San Bruno and owned by the SFIA, is approximately 1.4 acres and would be located at the community gardens south of Lion's Field Park. Selection of this route is subject to agreements with local authorities prior to the start of construction. The distance between this yard and the work area is approximately 0.6 miles.

  Alternative B is approximately 3.0 acres and would be located east of Belle Air Elementary School in the open area just south of the existing overhead PG&E transmission lines. The distance between this yard and the work area is approximately 0.7 miles. The site would be developed to avoid willows and seasonal wetlands in the area.

  Alternative C is approximately 3.0 acres and would be located in the undeveloped upland area west of Highway 101, just south of the Cupid Row Canal and just east of the existing CalTrain tracks and proposed BART mainline, as shown in Figure 3.13-3.

  The access route to the laydown area is not linked to the selection of one of these areas. Each alternative site would be accessed by workers and trucks traveling over one of the following routes:

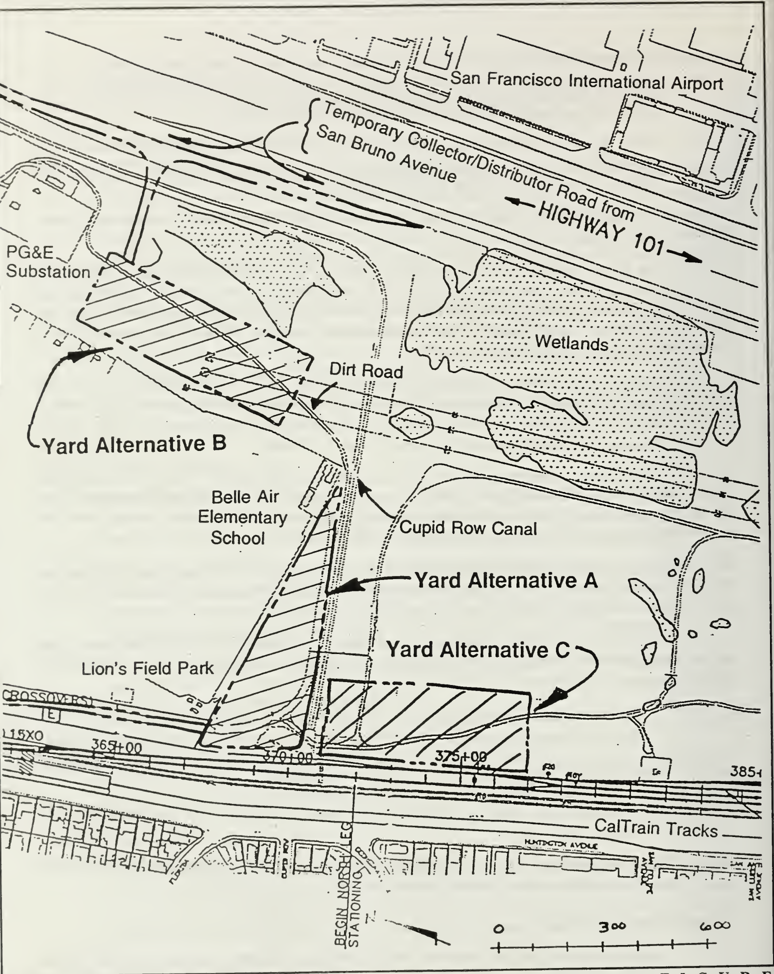
  1. The first route could connect to any of the sites via the existing dirt road located east of the Belle Air Elementary school. The dirt road would be connected to the existing collector-distributor road at the San Bruno Avenue interchange with Highway 101 for access to and from Highway 101.

  2. The second route would connect to any of the sites via 1st Avenue and San Mateo Avenue to Highway 101.

- **San Francisco Water Department Right of Way.** This stretch adjacent to the alignment could serve as a staging area for construction equipment.

Cupid Row to Santa Paula Avenue

- **Highway 101 and Airport Laydown Area.** Although no formal agreement has been reached, BART and SFIA have concurred, that to the extent legally permitted, the SFIA would design and



OGDEN

Temporary Laydown Yard Alternatives

FIGURE 3.13-3

construct the portion of the BART project east of the western edge of Highway 101, including the highway overpasses, the station at the International Terminal, and support structures. Construction activities for the Highway 101 crossing and all work within the SFIA property east of Highway 101 would be supported from contractor's storage and laydown areas located within the SFIA property east of the highway. After the aerial structure has been completed, BART contractors would install the trackwork, traction power and train control facilities, and complete the SFIA station.

- **CalTrain Right-of-Way.** This area would be located on acreage within the CalTrain right-of-way and used for construction access and temporary shooflies.
- **San Francisco Water Department Right of Way.** This stretch adjacent to the alignment could serve as a staging area for construction equipment.

Santa Paula Avenue to the Millbrae CalTrain Station.

- **Center Street to Millbrae Avenue.** A six-acre site along the SPTCo right-of-way would be required and is within the SPTCo property and the CCSF Water Department property.
- **Millbrae Avenue Station Laydown Area.** Construction of the remainder of the mainline from just north of Center Street to north of the Millbrae Avenue Station would be supported from a storage yard and staging area at the site of the Millbrae Avenue Station. All construction traffic would be routed over the BART mainline trackbed between this area and the construction area. Traffic would pass the Bayside Manor, Millbrae Manor, Marino Vista, and North Millbrae neighborhoods. The distance between this area and the work area is approximately 0.7 miles.
- **San Francisco Water Department Right of Way.** This stretch adjacent to the alignment could serve as a staging area for construction equipment.

PG&E Transmission Lines

The BART aerial tracks over the SFIA property west of Highway 101 would conflict with PG&E's existing overhead 115 kV transmission lines. The existing lines are currently constructed to the "minimum ground clearance," which means that the lowest point of the bottom conductor is approximately 30 feet above the ground. Since the aerial BART tracks would conflict with PG&E's existing 115 kV overhead transmission lines, the lines would have to be relocated.

BART has worked with PG&E to determine the best way of relocating the existing San Mateo–Martin 115 kV tower in the area where that the proposed aerial wye-stubs would cross the west of Bayshore parcel. In order to allow the BART aerial structures to pass beneath the transmission lines, PG&E would raise the lines by erecting five or six tubular-steel towers adjacent to the proposed BART structures. Installation of the new tubular towers would require the placement of a temporary construction-access berm, approximately 50 to 75 feet in width, within the wetland area between the two aerial wye-stubs. The earthen berm would be constructed on top of a matting material to reduce soil compaction and to enhance the recovery of the wetland after the new towers are erected and the area restored.

The site would be accessed via the existing paved and dirt roads on the west of Bayshore parcel south of the construction site. Temporary relocation of the transmission lines to a wood pole or "shoofly" line would be required. The shoofly line would be located on upland habitats along the dirt access road,

immediately west of the existing transmission alignment, and would remain in place until the work on the affected lines is completed.

The new PG&E tubular towers would require the placement of footings in the seasonal wetland on the east side of the west of Bayshore parcel. The excavation for the concrete footings would disturb a larger area than the area each column would displace. These impacts would be temporary, and the wetlands would be restored in place after the construction work is completed. The towers would be attached to small-diameter concrete pedestals rising from the concrete footings. The footings would be entirely below ground level.

A 12kV underground power line, located approximately 750 feet north of the Highway 101 southbound overpass into SFIA would be relocated to accommodate the footings for the BART aerial structure and the combined BART/ALRS guideway structures. BART has agreed to pay for relocating the power line to a point under Highway 101 approximately 750 feet north of its existing location. The work will be conducted by the SFIA under contract with BART.

Right-of-Way

The entire remainder of the former SPTCo San Bruno Branch railroad corridor between Colma and San Bruno would be purchased in fee for the long-term operation of the Aerial Design Option LPA. Some fee title property as well as some permanent and temporary easements would be purchased from the CCSF Water Department. South of the San Bruno branch right-of-way in San Bruno and Millbrae, temporary and permanent easements would be acquired in the existing JPB right-of-way. These easements and fee title property would vary in width along the project corridor. A few small, temporary and permanent fee purchases would be acquired from private property owners in various locations.

A permanent easement the width of the BART aerial structure, and maintenance easements 10 feet wide along each side of the structure on SFIA property, would be required for the long-term operation of project. Permanent maintenance roads would not be placed in any of the wetlands. The majority of maintenance for the BART aerial structure and associated operating controls would be accomplished by specially constructed vehicles that ride atop the aerial structure.

For the at-grade portion of the mainline between San Bruno and Millbrae, easement would be required for the land, from a point approximately midway between the existing CalTrain tracks and the new BART tracks to a point 15 feet outside the centerline of the easterly BART track. An additional 10 feet of temporary easement along the easterly side of the new mainline right-of-way would be required for the construction period. This easement property would be acquired from the existing JPB right-of-way. Additional right-of-way and easements east of the JPB property would be obtained from the SFIA.

Construction Activity Volumes

The volume of construction truck traffic, labor hours, and operating hours were estimated based upon the quantities of required construction materials and other activities contained in Appendix B of the Construction Scenario Report. Table 3.13-1 in this document provides a summary of construction activities for major phases of the construction effort for the entire project corridor. Truck activity includes removal of brush, trees, and excess excavated earth; delivery of ready-mix concrete, reinforcing steel, and other construction materials; and delivery of ballast, ties, rail, and other railway construction materials. The equipment operation hours represent only the time during which large internal-combustion

Table 3.13-1
Locally Preferred Alternative
Construction Quantities by Phase within the Project Corridor(1)

Item	Person Hours	Earthwork Cubic Yards(2)	Number of Trucks(3)	Equipment Hours(2)	Equipment/Comments
Utility	1,966	–	–	12,100	Backhoes, 2 Dump Trucks, Pickups
Roadway	352,434	–	–	52,600	Motor Graders, Loaders, 4 Dump Trucks
Earthwork	215,135	1,312,400	70,383	132,100	Dozers, Motor Graders, Scrapers, 29 Dump Trucks, Rollers, Power Shovels, 6 Water Trucks, Pickups
Structures	3,285,936	–	–	284,600	Conveyors, Ventilators, Jacks, Cranes, Generators, Drill Rigs, Tank Trucks, Pumps, 14 Cranes, 4 Concrete Trucks, Concrete Pumps, 4 Pickups, Special Trucks, Power Tools, Pile Hammers, Air Compressors, Fork Lifts, Backhoes, Dump Truck, Welders
Trackwork	193,061	–	–	20,200	5 Pickups, 2 Tamper Liners, 5 Loaders, Rollers, 28 Dump Trucks, Backhoes, Ballast Profilers, Track Welding Plants, Welders
Stations/Systems	1,129,641	–	–	1,700	Crawler Cranes, Hydraulic Cranes, Concrete Slipform Pavers
Totals	5,178,173	1,312,400	70,383	503,300	

Source: *Construction Scenario Report for Alternative VI Aerial Wye-Stub Design Option.* BATC August 1995.

1) The duration for all construction activities is estimated to be approximately 45 months.

2) Rounded to the nearest 100.

3) All trucks reported for earthwork activities, although some trucks would be used for other construction phases.

engines are being utilized. Small equipment, such as concrete vibrators and hand-held compactors, are not included. Construction quantities are presented for each of the four basic work activity areas in Table 3.13-2.

Roadway Lane Closures and Detours

The proposed BART extension would cross a number of local streets. These streets and the estimated time of disruption are presented in Table 3.13-3.

While the traffic areas are decked over, detouring of traffic around construction areas would occur temporarily in the vicinity of San Mateo, San Bruno, and Angus Avenues near Huntington Avenue in San Bruno. Normal traffic patterns would be restored as construction takes place under the decking. When construction is completed, traffic would again be detoured while decking is removed and paving restored. However, in most other areas, the layout of entryways to cemeteries and existing streets and higher traffic volumes would make detours around construction areas difficult. Therefore, in these areas, half of the roadway would be temporarily closed, with two-way traffic provided on the other half. The closed portion of the roadway would be excavated, shored, and decked in approximately one month. Two-way traffic would then be shifted to the decked portion while the other half is excavated, shored, and decked. On four-lane streets such as Chestnut Avenue and San Bruno Avenue, the same procedures would follow, so that four lanes of traffic could be maintained during most of the construction period. Traffic would be routed on the temporary decking for approximately nine to 12 months while the subway box is constructed below the decking. The process of closing one-half of the traveled way would be repeated at the end of construction so that the decking could be removed and the paving restored.

Construction Schedule

Construction of the Aerial Design Option LPA would take approximately 45 months to complete, including system testing. Construction would require one eight-hour shift per day, five days per week, for the majority of the work period. Some critical activities may require longer working hours per shift, in addition to Saturday or evening/late-night shifts. Heavy construction impacts would be experienced for about 24 months, between early 1997 and early 1999. Actual line/station construction activities are estimated to occur primarily between early 1997 and 2000.

13.2 Impact Assessment and Mitigation

Transportation

Significance Criteria

This section evaluates the short-term transportation impacts during construction of the proposed BART extension. While temporary in nature, construction activity will affect local and freeway traffic; SamTrans bus and CalTrain transit services; parking, pedestrian, and bicycle circulation; and freight movement.

Table 3.13-2
Locally Preferred Alternative
Construction Quantities by Major Work/Laydown

Work Area	Description	Truck Volume (trips)	Person Hours	Equipment Hours
San Bruno Yard	The San Bruno Yard covers all labor, equipment (dozers, graders, trucks, cranes, compressors, and concrete pumps), and construction equipment operation associated with the construction of the BART mainline, from the vicinity of Angus Avenue to just north of Center Street (including the aerial structures between the mainline and the westerly side of Highway 101).	14,400	467,000	91,000
Millbrae Yard	The Millbrae Yard covers all labor and construction equipment operation associated with the construction of the BART mainline, from just north of Center Street to the vicinity of Isabel Alley just north of the Millbrae Avenue Station, and includes dozers, graders, trucks, cranes, compressors, and concrete pumps.	16,000	323,000	66,000
Highway 101	The Highway 101 volumes cover all labor and construction equipment operation associated with the construction of the BART aerial structures across Highway 101, just west of the entrance to the SFIA, and includes trucks, backhoes, cranes, compressors, and concrete pumps.	600	38,000	6,500
SFIA	The SFIA volumes cover all labor and construction equipment operation associated with the construction of the BART aerial structures, located inside the SFIA property east of Highway 101, and includes trucks, backhoes, cranes, compressors, and concrete pumps.	6,100	480,000	41,500
		37,100	1,308,000	205,000

Table 3.13-3
Roadway Lane Closures for the LPA

Street Name	Traffic Lanes Existing/ Decked	Approximate Duration of Lane Restrictions[1]	Approximate Construction Time	Comments
Colma				
Serramonte Boulevard	4/4	4 months	9-12 months	Detour and deck all lanes of traffic.
Olivet Parkway	2/2	6 months	9-12 months	Detour and deck all lanes of traffic.
Mission Road	2/2	4 months	9-12 months	Detour and deck all lanes of traffic.
Serramonte Boulevard	4/4	4 months	9-12 months	Detour and deck all lanes of traffic.
Mission Road	2/2	4 months	9-12 months	Detour and deck all lanes of traffic.
South San Francisco				
Chestnut Avenue	7/7	4 months	9-12 months	Detour and deck all lanes of traffic.
West Orange Avenue	2/2	4 months	9-12 months	Detour and deck all lanes of traffic.
South Spruce Avenue	4/4	4 months	9-12 months	Detour and deck all lanes of traffic.
San Bruno				
Forest Lane/Herman Street	2/2	4 months	9-12 months	Detour and deck all lanes of traffic.
Huntington Avenue	0	20-30 months	20-30 months	Temporarily remove easterly parking lanes.
San Bruno Avenue	4/4	4 months	9-12 months	Detour and deck all lanes of traffic.
San Mateo Avenue	2/2	4 months	9-12 months	Detour and deck all lanes of traffic.
Angus Avenue	2/2	4 months	9-12 months	Detour and deck all lanes of traffic.
Millbrae				
Center Street	2/2	4 months	9-12 months	Detour and deck all lanes of traffic.
Rollins Road/Aviador Avenue	2	none	none	To be replaced by new extension of Hillcrest Boulevard to new connection with Aviador Avenue for access to Bayside Manor neighborhood.

Source: *SFO Airport Extension Preliminary Construction Scenario Report*, BATC November 1993 and May 1994.

Notes:

1) Each street will be restricted for a total of approximately four months in two increments; two months when the temporary decking is installed, prior to the construction of the subway, and again for approximately two months after the subway is complete and backfill has been placed over the box.

Construction of the project would create a significant project-specific or cumulative impact if it involved complete closures of streets, sidewalks, or bicycle routes; reduction in street widths; reduction in lane widths; construction activity on or near streets that are currently heavily congested; schedule delays or route changes to transit services; or the relocation of streets, sidewalks, and railroad tracks for an extended period. In cases where the construction methods and/or staging fail to reduce the projects impact to an insignificant level, mitigation measures are proposed in this FEIR/FEIS to further reduce or prevent impacts.

Vehicular and pedestrian access to adjacent residential or commercial properties and special uses such as cemeteries would be maintained during construction. Construction activity at proposed station locations would generally take place within the boundaries of the construction site, without significant periods of activity on adjacent streets. The short-term loss of parking near construction zones would not be considered a significant impact.

Project-Specific Analysis

1. *Street capacity would be reduced by one-half during construction of the cut-and-cover subway across Serramonte Boulevard, Mission Road, and Orange Avenue. (I)*

   During construction of the Serramonte Boulevard, Mission Road, and Orange Avenue subway crossings, half the street would be closed while two-way traffic operation would be permitted on the other half of the street. Temporary decking would be installed in place of the existing pavement. Once completed, the process would be repeated for the other side of the street. Restricted lanes would be in place from two to four months depending upon the extent of utility relocation required.

   Construction of the Mission Road subway crossing would not significantly impact traffic using Mission Road or nearby intersections. Similarly, there would be insignificant impacts to the scheduling or routing of SamTrans bus routes 22D and 26H. Construction activity would have an insignificant impact on the signed bicycle route on Mission Road. Impacts would be insignificant because Mission Road would only be closed one half at a time, permitting continued bus service and bicycle circulation.

2. *Olivet Parkway would be temporarily closed for approximately 4 to 6 months. (S)*

   Access to cemeteries via Olivet Parkway would be detoured to Hillside Boulevard for approximately 4 to 6 months. Signage would be provided to direct cemetery traffic during this period.

   MITIGATION MEASURES. Implementation of the following mitigation measure would reduce this impact to an insignificant level.

   2.1 *Provide Detour Signs and Deck Half the Streets.* Access to the Eternal Home Cemetery and Salem Memorial Park via Olivet Parkway would be detoured to Hillside Boulevard and signage provided in consultation with these cemeteries, while Olivet Parkway is closed for two periods of approximately two to three months. Temporary decking would be installed in place of the existing pavement. Once completed, the process would be repeated for the other

side of the street. Restricted lanes would be in place for a total of from four to six months during construction of the decking depending upon the extent of utility relocation required.

3. *Cut-and-cover construction at Chestnut Avenue would reduce street capacity and interfere with operations at the El Camino Real/Mission Road intersection. (S)*

Currently, in the P.M. peak hour, the intersection of Westborough (Chestnut) and El Camino Real operates at LOS C, and the intersection of Chestnut and Antoinette operates at LOS A. Antoinette Lane and El Camino Real, however, are approximately 100 feet apart. Construction activity in this segment would eliminate vehicle queuing space on the east approach to El Camino Real and interfere with access for residents of Antoinette Lane.

MITIGATION MEASURES. Implementation of the following measure would partially reduce the impact, but disruption to local circulation would remain significant and unavoidable during the time the street decking is constructed.

3.1 *Deck Half the Street.* Chestnut Avenue will remain open during construction, although four of the seven lanes will be closed while decking across the roadway is constructed, after which those lanes would be reopened and the remaining three lanes decked. A left turn lane on eastbound Chestnut Avenue into Antoinette Lane will be maintained during construction of this decking. The decking will take between two and four months depending upon the extent of utility relocation required.

4. *The subway section across South Spruce Avenue would result in partial closure of this street and disrupt traffic, transit, pedestrian, and bicycle circulation. (S)*

South Spruce Avenue would also remain open during construction although two of the four lanes would be closed while decking across the roadway is constructed, after which those lanes would be reopened. The decking over both these streets in the construction area would take between two and four months depending upon the extent of utility relocation requirements.

MITIGATION MEASURES. Implementation of the following mitigation measure would reduce this impact. The impact, however, would remain significant and unavoidable during construction of the decking.

4.1 *Deck Half the Street.* South Spruce Avenue will remain open during construction, although two of the four lanes will be closed while decking across the roadway is constructed. The lanes will be reopened after construction. The decking over this street in the construction area will take between one and two months depending upon the extent of utility relocation required.

5. *Construction activity south of I-380 would disrupt traffic on Forest Lane/Herman Street. The temporary reduction of parking on Huntington Avenue in the vicinity of Forest Lane would not be a significant impact. (S)*

Between Tanforan Avenue and Forest Lane, the alignment would continue in cut-and-cover on the current alignment of Huntington Avenue, crossing Forest Lane/Herman Street just south of I-380. The construction of the alignment would disrupt traffic flow through the intersection of Huntington

Avenue and Forest Lane/Herman Street. According to the significance criteria, the short-term loss of parking on Huntington Avenue just south of Forest Lane is not considered a significant impact.

MITIGATION MEASURES. Implementation of the following mitigation measure would reduce this impact to an insignificant impact.

5.1 *Traffic Detour and Decking Across Streets.* A separate traffic detour will be constructed on vacant land that widens Huntington Avenue from just south of the existing Forest Lane alignment to just north of San Bruno Avenue. This detour would serve traffic on Huntington during construction through the existing intersection of Huntington Avenue and Forest Lane/Herman Street. In addition, decking will be constructed to maintain the connections between Forest Lane/Herman Street and the Huntington Avenue detour. In this manner, traffic flow through the intersection of Huntington Avenue and Forest Lane/Herman Street would be maintained during construction of the alignment through the vicinity.

6. *Construction of the Tanforan Station would have a minimal effect on traffic, transit, pedestrians and bicycles, and parking. (I)*

Station construction would generally be confined to within the site. Although construction activity may require temporary parking restrictions or brief street closures, these impacts would not be considered significant because of their short-term nature.

7. *During excavation of the cut-and-cover subway section, several streets in downtown San Bruno would be partially closed for two to four months, potentially affecting traffic and pedestrians. (S)*

South of I-380, the alignment would remain below grade in a cut-and-cover subway, crossing San Bruno Avenue, San Mateo Avenue, and Angus Avenue, each of which would be partially closed at the start of and at the end of construction. First, capacity on San Bruno Avenue would temporarily be reduced from four lanes to two lanes while decking is constructed. This would be repeated for the other half so that temporary decking would extend across the entire street. Next, capacity on San Mateo Avenue would temporarily be reduced, one half at a time, until decking across both halves of each roadway was completed. An alternative traffic plan for San Bruno Avenue and San Mateo Avenue during construction would be to construct a detour adjacent to San Bruno Avenue that would carry traffic diverted from both San Bruno and San Mateo Avenues. Such a detour would maintain four lanes of traffic during construction. Please see Impact 8, below, for a discussion of impacts to Angus Avenue. Minor delays to traffic would result on streets undergoing construction.

A minimum of one parking lane on Huntington Avenue would be temporarily closed. The parking area between Huntington Avenue and the CalTrain track would be temporarily closed for up to three years.

MITIGATION MEASURES. Implementation of the following measures would reduce the impact of partial street closure, but it would remain significant and unavoidable during the time the decking is being installed and later when the decking is removed or while the detour is in use.

7.1 *Deck Half the Streets or Construct a Detour.* As specified in the preliminary construction scenario report, streets to be crossed during construction will be decked to permit two-way through traffic. Accordingly, San Bruno Avenue and San Mateo Avenue will be decked during construction to permit two-way through traffic. Alternatively, a detour adjacent to San Bruno Avenue would be constructed to serve San Bruno Avenue and San Mateo Avenue during construction.

7.2 *Keep Adjacent Sidewalks Open.* As specified in the preliminary construction scenario report, the adjacent sidewalk will be kept open to pedestrian traffic during all phases of construction. Temporary sidewalks will be a minimum of four feet wide.

7.3 *Expanded Use Of Downtown Parking Spaces.* A combination of the following or equivalent measures would accommodate displaced parking, if any, along Huntington Avenue: (i) existing downtown public lots would be restriped and reconfigured to create additional spaces; (ii) additional parking spaces would be created on vacant city property on Huntington Avenue; (iii) existing spaces in private lots along Huntington Avenue, south of San Bruno, and along San Bruno Avenue and 1st Street would be subleased; and (iv) parking restrictions in existing downtown lots would be revised to allow greater use. BART would pay only for the actual costs incurred in implementing any replacement parking plan.

8. *Street capacity would be reduced by one-half during construction of the cut-and-cover subway across Angus Avenue and Center Street. (I)*

During construction of the Angus Avenue and Center Street subway crossings, half the street would be closed while permitting two-way traffic operation on the other half of the street. Temporary decking would be installed in place of the existing pavement. Once completed, the process would be repeated for the other side of the street. Restricted lanes would be in place from two to four months depending upon the extent of utility relocation required. The adjacent sidewalk would be kept open to pedestrian traffic during all phases of construction. Temporary sidewalks would be a minimum of four feet wide.

9. *Pedestrian access between the Fifth Addition neighborhood and the Tanforan and Towne Center Shopping Centers would be closed during construction. (I)*

MITIGATION MEASURES. There would be a loss of informal pedestrian connections across the existing SPTCo right-of-way; however, these informal crossings are dangerous and would not be permitted by BART. A temporary detour will be provided by BART. Pedestrians using this detour would need to walk an additional 3,000 feet to access the shopping centers, as measured from the crosswalk on Huntington Avenue directly opposite South Bayshore.

10. *Construction of the aerial wye-stub alignment over Highway 101 would not significantly impact freeway traffic or disturb circulation at the SFIA. (I)*

Lane restriping on the freeway would be necessary to accommodate construction of the piers and foundations. Temporary barrier rails would be installed on the freeway to separate construction areas from freeway traffic. Both of these activities would restrict and/or impede traffic flow along Highway 101, causing congestion and travel delays in the vicinity of the SFIA. In addition, these

construction activities would interfere with access into and out of the SFIA. In recognition of these potential effects, BART proposes to perform lane restriping and installation of girders crossing Highway 101 between 11:30 P.M. and 4:30 A.M. to minimize the effect on peak-hour freeway travel and airport access. Because traffic during these hours is light, disruption of Highway 101 traffic and SFIA access would be insignificant. Construction of the foundation columns of Highway 101 and the erection of falsework beams across the freeway would be accomplished during regular hours. Construction of the aerial wye-stub alignment on SFIA property east of Highway 101 would not significantly affect traffic circulation on airport roadways.

11. *Construction-related delays and detours in downtown San Bruno and near Millbrae Avenue may affect SamTrans bus routes. (S)*

SamTrans bus routes 30B, 3B, 33C and 32P use streets that may be affected by construction. To the extent feasible, construction activity would be planned during off-peak periods. SamTrans bus route 33C would likely experience delays on Aviador Avenue during station construction. Construction-related delays as a result of temporary lane closures would not be significant. Bus routes may need to be re-routed during construction. The resulting delays from posted detours and bus re-routing would be potentially significant to peak hour and off-peak bus service.

MITIGATION MEASURES. The following measure would reduce the impact to an insignificant level.

11.1 *Coordinate Construction Schedule with SamTrans.* The partial closing of cross streets will be coordinated with SamTrans to facilitate bus re-routing, schedule adjustments, and preparation of advance bulletins.

12. *Construction of the Millbrae Avenue Station and nearby street improvements would cause delays and detours of local traffic. (S)*

Station construction would occur within the site and would not affect transportation on adjacent streets; however, other project construction activity may temporarily close parking or traffic lanes on adjacent streets.

Existing access to the Bayside Manor neighborhood would be closed at Aviador Avenue and the storm drainage channel. Access to the neighborhood would be replaced by an extension of Hillcrest Boulevard, under the BART alignment, connecting El Camino Real and Aviador Avenue.

Rollins Road east to Millbrae Avenue would be widened to provide access to the parking structure and emergency access to a street north of the parking facilities.

MITIGATION MEASURES. The following measures would reduce the traffic delay and detour impacts to an insignificant level.

12.1 *Coordinate Hillcrest Boulevard Extension.* Hillcrest Boulevard will be extended prior to the closing of Aviador Avenue to minimize disruptions to neighborhood access.

12.2 *Maintain Two-way Traffic on Rollins Road.* During widening, the street will be open to two-way traffic, with a minimum of one lane in each direction, prior to completion of the Hillcrest Boulevard extension.

13. *The LPA alignment would cross several existing signed bicycle routes on West Orange, Chestnut, South Spruce, Huntington, San Bruno, and Angus Avenues as well as McDonnell Road. (S)*

MITIGATION MEASURES. Implementation of either of the following mitigation measures would reduce this impact to an insignificant level.

13.1 *Cyclist Detours.* During construction, open lanes or detours will be provided and paved or otherwise made safe for cyclists.

13.2 *Alternate Cyclist Routes.* If Mitigation Measure 13.1 is determined to be infeasible, alternate bicycle routes using other streets to bypass the construction zone will be clearly posted. The alternate bicycle routes could increase trip length for cyclists.

14. *Construction activity within the project alignment would impact students using informal foot paths that cross the right-of-way. (I)*

Construction activity would limit the ability of students at El Camino High School to use the informal foot paths that currently traverse the right-of-way. Construction activity in the right-of-way near South San Francisco High School and Los Cerritos Elementary School would similarly limit student pedestrians from using informal foot paths along the right-of-way. This would not be considered a significant impact because the right-of-way is not public. Pedestrians and bicyclists could use existing sidewalks and streets.

15. *The installation and relocation of existing utilities would impact traffic, transit, pedestrian, and bicycle circulation, but the disturbance would be limited. (I)*

Utility installation may require temporary or partial street closing or reduction in the number of traffic lanes. Utilities include storm drains, sanitary sewer, natural gas, fiber optics, potable water lines, power lines, and communication lines of PacBell, AT&T, Sprint and MCI. Since installation of BART utilities would occur concurrently with construction of the BART extension, interference with local circulation would not be worse than already predicted in the preceding impacts. The installation of utilities would create only minor inconveniences for traffic, transit, parking, pedestrians and bicycles, and freight operations.

16. *The addition of construction vehicles on surface streets would impact traffic circulation. (I)*

The removal of excess earth for the subway and retained cut segments of the project would require an average of five to ten trucks per hour, with the peak number between ten and 15 trucks per hour. The daily number of trucks under this scenario would be between 50 and 80 trucks, continuing six to seven months during excavation. In addition, large concrete pours would require approximately ten trucks per hour over an eight- to 12-hour period, or between 80 and 120 trucks per day. These concrete pours would occur for approximately two days per week over a period of ten to 11 months. The remaining truck traffic for delivery of various construction-related materials would range from

approximately one to five trucks per hour. Excavation activity would occur before the beginning of the concrete pours, and the two activities would only overlap for two to three weeks.

Haul routes will be coordinated and predetermined by agreements with local authorities prior to construction. The haul route analyzed uses local streets to access the freeway from the staging area south of Lion's Field. Under one option, trucks would travel north on First Avenue and northeast on San Mateo Avenue to Highway 101. Truck volumes at these locations would not significantly impact the level of service at local intersections.

A second haul route option would use the dirt road east of Belle Air School to access a new connection to the existing collector-distributor/road to Highway 101. This new connection would require approval from Caltrans and agencies responsible for the wetlands west of Highway 101. This new connection to the collector-distributor road would include temporary acceleration and deceleration ramps.

Truck access to the laydown area at the Millbrae Avenue Station would be from Highway 101 to Millbrae Avenue and north on Rollins Road. The truck volumes at the Millbrae Avenue and Rollins Road intersection would not significantly impact traffic.

MITIGATION MEASURES. Although this impact would be insignificant, the following mitigation measures are suggested to further reduce potential impacts. Mitigation Measure 16.5 would not be required if Mitigation Measure 1.1, i.e., temporary noise barriers, recommended in the Construction/Noise and Vibration discussion of this section, were implemented within the BART right-of-way or if contractor laydown Alternative B were selected.

16.1 *Designation of Construction Vehicle Routes within BART Right-of-Way.* Wherever possible, access to construction sites will be made using the BART right-of-way to minimize impacts to local streets.

16.2 *Coordination of Vehicle Routes with Local Jurisdictions.* Haul routes from staging areas to construction sites and to fill disposal sites should be predetermined by agreements with local authorities prior to construction. The routes will follow streets and highways that provide the safest route and have the least impact on existing traffic.

16.3 *Provide Additional Traffic Control.* At locations where construction traffic will enter major streets such as Millbrae Avenue, additional traffic control such as signals, warning signs, or flaggers will be used to smooth traffic movement.

16.4 *Provide Temporary Acceleration/Deceleration Lanes.* At locations where construction traffic would enter Highway 101, acceleration/deceleration lanes will be provided to facilitate merging into traffic.

16.5 *Restrict Parking to One Side of First Avenue during Construction at the San Bruno Laydown Area.* Parking could be prohibited along the west side of 1st Avenue, next to the CalTrain mainline tracks between Lion's Field and San Mateo Avenue, dependent upon agreements with local authorities. This restriction would occur during the two years of intensive

construction activity at Laydown area Alternative A, B or C (if this access route is chosen). The additional operating width on 1st Avenue will permit continuous flow of two-way traffic during the construction period.

17. *Construction activity would disrupt CalTrain service. (S)*

Between the I-380 overpass and Cupid Row, the western CalTrain track would be taken out of service for 12 to 18 months; CalTrain service would continue on a single track. Construction of the extension of Hillcrest Boulevard under the CalTrain tracks would take about four months; CalTrain service would continue on two tracks.

Relocation of CalTrain tracks in the vicinity of the Millbrae Station would require approximately four months.

MITIGATION MEASURES. The following measures would reduce construction impacts to CalTrain service. Minor delays would be insignificant.

17.1 *Provide a Double Shoofly.* Use one or two shoofly tracks to permit continuous two-track operations and coordinate with CalTrain to ensure that shooflies are equipped to standards required by CalTrain.

17.2 *Perform all Work on Installation and Tie-in of Shooflies during Off-peak Periods.* The installation and tie-in of shooflies will be done during off-peak hours and at night, maintaining two tracks for CalTrain during peak commute hours.

17.3 *Distribute Advanced Passenger Bulletins Announcing Potential Service Delays.* Bulletins would be posted at CalTrain stations where train arrival times would be affected during construction of the BART extension. If delays to scheduled CalTrain arrivals were consistently significant (more than five minutes), BART would pay for the printing of new CalTrain schedules.

17.4 *Maintain Two-track Operations During Construction at Hillcrest Boulevard and Millbrae Station.* To deal with the Hillcrest Boulevard grade separation, techniques such as tunneling will allow uninterrupted train operations. If deemed infeasible, a temporary bridge structure supporting the tracks will be installed during off-peak hours. Temporary shooflies will be used at these locations to maintain operations on two tracks.

17.5 *Temporary Relocation of San Bruno Passenger Station.* During construction of the subway, the existing CalTrain station platforms, shelter, and parking will be moved to the vicinity of the I-380 overpass. Upon completion, the station facilities will be moved back to the existing location.

18. *The use of shooflies may cause minor delays to existing freight service. (I)*

19. *Construction of the Airport International Terminal Station would impact existing access roads, but existing flows can be maintained without significant delays. (I)*

Existing traffic flows can be maintained at all times by construction temporary detours on the two

sides and in the median to allow two lanes of traffic to be taken out of service for a month. During this time, a slurry or sheet pile wall would be installed, the upper 10 feet of fill removed, a temporary deck installed, and the lanes returned to traffic.

With traffic operating on temporary decking on all lanes as described, above, the end slurry or sheet pile walls would be completed, the box excavated and braced, the invert slab placed, the subway box structure installed, utilities reinstalled, and backfill installed.

This construction plan has proven to be an effective mitigation to traffic disruption on every major subway construction in the United States.

Cumulative Analysis

The same significance criteria described for the project-specific analysis apply to the cumulative analysis. Cumulative impacts of the BART extension are those that result from other construction projects occurring in the study area concurrent or in close succession with impacts generated from the project. No construction projects and/or definitive project schedules have been identified at this time which are known to be concurrent or in close succession with the extension project. Therefore, no significant cumulative effects are anticipated. If construction-related activities associated with the Hickey Boulevard extension and the El Camino Corridor redevelopment project were to occur simultaneously with construction of the BART alignment and station, then construction-related cumulative impacts in the area of transportation would be potentially significant. Transportation-related impacts, such as proposed truck routes, street closures or detours, and changes in pedestrian or bicycle access would be coordinated with local jurisdictions. Therefore, any cumulative effects of BART construction with other projects, particularly during the first two years of construction, would be coordinated with local jurisdictions at that time.

The SFIA is planning to construct new freeway ramps connecting Highway 101 with the Airport GTC. The construction schedule and methods proposed for the ramps are unknown at this time and may have an impact of freeway operations. The Aerial Design Option LPA would traverse Highway 101 just to the north of the SFIA International Terminal inbound/outbound ramps. Construction of the foundations, columns, and superstructures over the freeway would require narrowing mainline freeway lanes, lane closures, and night time detour for both projects. SFIA will coordinate with BART and Caltrans ramp construction to minimize traffic disruptions on Highway 101. SFIA would be responsible for constructing that portion of the aerial wye alignment that crosses Highway 101 as part of the Airport inbound/outboard ramps to minimize overall duration of freeway impacts and costs to both agencies. A single contractor would undertake all construction over Highway 101. Construction truck traffic to the Aerial Design Option LPA on SFIA property east of Highway 101 would not combine with SFIA-related traffic to cause cumulative impacts because the construction traffic would not use the airport terminal access roadways to and from Highway 101 but would use McDonnell Road and Road R-2 to gain access to Highway 101.

In addition, if direct access to Highway 101 from one of the three alternative laydown areas in the City of San Bruno, as shown in Figure 3.13-3, crosses SFIA property west of Highway 101, then coordination with the SFIA ramp improvements would be required. Such coordination would be achieved through the Caltrans permitting process.

Significance Criteria

Construction of the project would create a significant impact if it disrupted the physical and social arrangements of an established community; disrupted businesses because of loss or impeded access; conflicted with established recreation or education uses of an area; or increased the level of activity (traffic, parking, noise), thereby detracting from the quality of a neighborhood. Construction impacts to neighborhoods not discussed below may be found in this section under Transportation, Visual Quality, and Noise and Vibration.

Project-Specific Analysis

Colma

1. *Construction activities would temporarily disrupt activities at the cemeteries. (S)*

   MITIGATION MEASURES. Implementation of the following mitigation measure would reduce the impact, but disruption at the cemeteries would remain significant and unavoidable.

   1.1 *Coordination with Cemeteries.* Very early in the construction planning process and throughout the construction period, BART will work closely with the cemeteries to design and implement plans to minimize the construction impacts. The plans will cover all elements of construction impacts, including location and design of staging areas, truck routes, time of day of construction activities, methods for minimizing noise and dust, etc. The plans will also include a public information component so that the cemeteries will be kept informed of the timing and nature of the disruptions during construction.

2. *An unpaved parking area west of Holy Cross Cemetery with approximately 60 parking spaces, at a minimum, would be displaced during the construction period. (S)*

   MITIGATION MEASURES. The federal Uniform Relocation Act (Public Law 91-646) and the California Relocation Act (Chapter 16, Section 7260 *et. seq.* of the Government Code) and related laws and regulations contain specific requirements that govern both land acquisition and relocation. For purposes of the relocation act, parking lots are considered businesses. Under these laws, BART/SamTrans would be required to develop a detailed relocation plan to minimize impacts on businesses. The plan would assess relocation needs and provide relocation information, assistance, and payments. Minimum relocation payments are detailed in the laws and include moving and search payments for businesses. Relocation assistance programs for businesses include, at a minimum, referrals to comparable locations. Implementation of the Uniform Relocation Act would reduce this impact to a less than significant level.

   BART/SamTrans staff have conducted community workshops and open houses in South San Francisco, San Bruno, and Millbrae to discuss property owners' questions and rights. Real estate workshops will be held in communities and neighborhoods that would be directly affected by the project.

3. *Construction activity would disrupt normal vehicular access to businesses on Serramonte Boulevard east of the right-of-way. (S)*

MITIGATION MEASURES. The following measure, in combination with decking and detouring (identified as part of the project under Impact 1 in the Construction/Transportation section) would maintain access to businesses but would not prevent the disruption and inconvenience resulting from construction activities. Accordingly, this impact would remain significant and unavoidable.

3.1 *Coordination with Cities.* Very early in the construction planning process and throughout the construction period, BART will work closely with the cities to design and implement plans to minimize the construction impacts to the various neighborhoods and schools, as well as to the cities as a whole. The plans will cover all elements of construction impacts, including location and design of staging areas, truck routes, time of day of construction activities, methods for minimizing noise and dust, etc. The plans will also include a public information component so that residents and businesses remain informed of the timing and nature of the disruptions.

South San Francisco

4. *Construction activities would reduce access across the alignment and particularly restrict access to Orange Memorial Park for residents living west of the proposed right-of-way. (I)*

People use the railroad right-of-way as a short-cut (across and along it), although such use constitutes trespassing. Construction activity would limit access points across the SPTCo right-of-way to public crossings. Restricting access in this area is not considered a significant effect, since the BART alignment would preclude illegal access to the right-of-way and require pedestrians to use the proper crossings, where safety measures would be in place.

San Bruno

5. *Construction activities at the contractor laydown areas in San Bruno would disrupt the adjacent Belle Air neighborhood. (S)*

Laydown area Alternative A would displace the community gardens located immediately south of Lion's Field Park. Loss of this neighborhood/community area would constitute a significant land use and neighborhood impact. In addition, Alternative A, being adjacent to the park, would adversely affect use of the park. Impacts to Lion's Field Park resulting from adjacent construction are discussed in Chapter 5, Section 4(f) Evaluation. Selection of Alternative B or C would avoid this impact. Alternative B would lie between the Belle Air neighborhood and Highway 101. Its proximity to residences along 7th Avenue and the Belle Air Elementary School would mean construction activities and equipment mobilization would adversely affect the neighborhood.

Alternative C would be the furthest from Belle Air residents and community facilities such as Belle Air Elementary School and Lion's Field Park. As a result, this laydown area would have insignificant effects on this San Bruno neighborhood.

It should be noted that the above discussion focuses on the laydown area itself. Each one may be accessed by either of two optional haul routes. For construction impacts along the haul routes, refer to Impact 6, below.

MITIGATION MEASURES. Mitigation Measure 3.1, i.e., coordination with cities, applies to this impact. In addition, Mitigation Measure 1.1, i.e., temporary noise barriers, recommended in

Construction/Noise and Vibration, applies. These measures together would reduce all laydown area impacts on neighborhoods except for the displacement of the community gardens, an effect which would remain significant and unavoidable.

6. *Construction activities along the proposed haul routes from any of the San Bruno laydown area options would disrupt the Belle Air neighborhood in San Bruno. (S)*

The Belle Air neighborhood would be affected by approximately 14,400 truck trips that would generate noise, dust, and potential safety hazards. Both haul route options between the contractor laydown optional sites and Highway 101 would pass sensitive receptors in the Belle Air neighborhood. The 1st Avenue-to-San Mateo Avenue route would pass Lion's Field Park and residences along 1st Avenue. Access to these areas as well as Belle Air Elementary School and the community gardens from the Cupid Row area west of the tracks would be restricted.

The second possible haul route would use an existing dirt road east of the Belle Air residences along 7th Avenue and west of Highway 101. This route would not interfere with local circulation within the Belle Air neighborhood nor restrict access to Belle Air community facilities from other neighborhoods in the city. Use of this haul route would, however, direct the truck trips past the homes on 7th Avenue and the Belle Air Elementary School.

MITIGATION MEASURES. Mitigation Measure 3.1 recommended above, i.e., coordination with cities, and Mitigation Measure 1.1, i.e., temporary noise barriers, recommended in the Construction/Noise and Vibration discussion of this section, i.e., temporary road and wall construction, apply to this impact. These measures in combination with the following one would reduce San Bruno neighborhood impacts to an insignificant level.

6.1 *Traffic Control.* BART, in consultation with the City of San Bruno, will work cooperatively to ensure that traffic control is provided in the vicinity of the Belle Air Elementary School during school hours and officially sanctioned recreational activities at Lion's Field Park. The dates and times of these recreational activities at Lion's Field Park must be provided to designated BART staff at least 48 hours in advance of the activity to allow proper scheduling of traffic control measures.

7. *Construction activity would disrupt normal vehicular access for businesses relying on access from Huntington, San Bruno, and San Mateo Avenues. (S)*

The construction of parking at the Tanforan Park Shopping Center, temporary closure of parking between Huntington Avenue and the CalTrain tracks, and cut-and-cover construction under San Bruno and San Mateo Avenues would limit access to businesses, as portions of the streets are closed and parking is replaced for up to three years.

MITIGATION MEASURES. Implementation of Mitigation Measure 7.3 recommended under Construction/Transportation, i.e., expanded use of downtown parking spaces, applies to this impact and combined with Mitigation Measure 3.1, recommended above, i.e., coordination with cities, would reduce this impact to an insignificant level.

Millbrae

8. *Approximately 16,000 truck trips in the vicinity of the Millbrae Avenue Station would potentially affect residents along Hemlock Avenue and in the Bayside Manor, Marino Vista, and North Millbrae neighborhoods. (S)*

   Mobilization activities from the Millbrae laydown area would disturb residents between the Millbrae Avenue Station and Center Street. Although the CalTrain right-of-way would be used for construction, it is adjacent to homes in Marino Vista, North Millbrae, Bayside Manor, and Millbrae Manor and would adversely affect this stretch for approximately 45 months.

   MITIGATION MEASURES. Mitigation Measure 3.1 recommended above, i.e., coordination with cities, applies to the impact in Millbrae. Mitigation Measure 3.1 in combination with the following measure would reduce impacts to Millbrae neighborhoods to an insignificant level.

   8.1 *Temporary Visual and Noise Barriers.* BART will construct temporary sound and visual barriers along the east and west perimeters of the work area to reduce noise impacts to or below BART's construction noise criteria. Implementation of this measure would result in a temporary, significant visual impact because of its proximity to homes and the sense of enclosure the walls would create.

9. *Construction of the Millbrae Avenue Station would cause a significant increase in activity, thereby detracting from the quality of life in the Bayside Manor neighborhood. (S)*

   While the noise and visual effects of construction activities can be minimized, the duration and level of construction activity at the Millbrae Avenue Station site would significantly alter the residential character of the Bayside Manor neighborhood, which lies immediately north of the station. For approximately 45 months, Bayside Manor residents would be exposed to noise, dust, and changes in local circulation. These annoyances would interfere with daily activities and routines and detract from the neighborhood's quality of life.

   MITIGATION MEASURES. Implementation of Mitigation Measures 3.1 recommended above, i.e., coordination with cities, would reduce this impact, but it would remain significant and unavoidable.

10. *Construction of the proposed project would generate temporary employment of about 1,500 to 2,000 person years during the construction period, which in turn would stimulate further employment and expenditures in the Bay Area. (B)*

Cumulative Analysis

Cumulative impacts on land uses and neighborhoods would occur if the BART extension were constructed concurrently with other known, pending, or foreseeable projects, such as the Hickey Boulevard extension and expansion activities at the SFIA. These impacts include increased noise, dust, construction traffic, movement of construction equipment, and visual disruption, all of which cumulatively detract from the character of a neighborhood or community. These types of impacts are likely to be experienced in South San Francisco and at the SFIA, if the SFIA expansion and Hickey Boulevard extension projects occur within the same time frame. Mitigation Measure 3.1, recommended above, i.e., coordination with cities and the SFIA would partially reduce the cumulative neighborhood impacts, but impacts would remain significant. The communities of Colma, San Bruno, and Millbrae

would not be expected to experience cumulative effects, because there are no major projects anticipated in these areas whose impacts would cumulate with those of a BART extension.

Visual Quality

Significance Criteria

Construction of the BART extension would result in a significant project-specific or cumulative visual impact if significant views, scenic resources, or existing features which contribute to a well-defined streetscape were eliminated. A significant impact would also result if construction activities and mobilization or laydown areas were closer than 60 feet to a sensitive receptor (the distance from which facial features are discernible), because a feeling of encroachment may be perceived at this distance. In this analysis of construction-period impacts, compatibility with the built environment is not a criterion, as it was in the operations analysis, because it is not relevant.

Project-Specific Analysis

Colma

1. *Cut-and-cover construction through Colma and clearing of laydown/mobilization areas would eliminate mature trees identified as scenic resources within the Colma cemeteries. In addition, bulldozers, loaders, and dump trucks used to clear and grub the site and haul topsoil would temporarily affect the existing visual landscape and tranquil experience of cemetery visitors, and detract from the greenbelt image of El Camino Real. (S)*

   Since construction traffic would access the BART right-of-way within the cemeteries via existing roadways, including Olivet Parkway and Serramonte Boulevard, truck traffic would not disrupt the visual setting for cemetery visitors. Two exceptions to this would be access via the driveways of the Cypress Lawn Memorial Park and the Home of Peace Cemetery. Although construction traffic along these driveways would be coordinated with the cemeteries to avoid disruption to funeral services, the visual setting would be altered by the presence of construction activities and vehicles.

   MITIGATION MEASURES. Mitigation Measure 1.1 below would reduce the long-term impact of tree removal and should be implemented in conjunction with Mitigation Measure 2.1, i.e., vegetation replacement recommended under Section 3.3, Visual Quality. Nevertheless, short-term alterations to the area's landscape and greenbelt image would remain significant and unavoidable during the construction period.

   1.1 *Landscaping.* BART will plant drought-tolerant, fast-growing landscaping at a density that would recreate the visual screening now provided by the mature trees. The goal of this measure would be to preclude views onto cemetery grounds from El Camino Real, and vice versa, where they do not now exist.

   1.2 *Laydown Area Visual Barrier.* BART will erect fencing around construction laydown areas to screen views of equipment and materials from sensitive receptors. To the extent feasible, the fencing material will be consistent with the town's desired greenbelt image along El Camino Real, which can be accomplished with various techniques, such as a chain-link fence with redwood slats.

2. *Construction of the sound wall at the Daly City Shop/Yard would occur within 60 feet of residences in the Meadowbrook Trailer Park. (S)*

Constuction activities within 60 feet would create a sense of encroachment to residences of Meadowbrook Trailer Park.

MITIGATION MEASURES. No feasible mitigation exists to reduce impacts to sensitive receptors adjacent to the wall. The construction-period impact to sensitive receptors would be significant and unavoidable.

South San Francisco

3. *Construction activities would occur within 60 feet of identified sensitive receptors in South San Francisco, resulting in a perception of encroachment. This would be a significant effect during the construction period. Construction activities at the proposed laydown areas and at the station site would also be visible. While this represents a noticeable change to the visual setting of South San Francisco, it would not be significant, because important views and scenic resources would not be disturbed and streetscapes in the vicinity would not be adversely affected. (S)*

MITIGATION MEASURES. No feasible mitigation exists to reduce impacts to sensitive receptors. The construction-period impacts to sensitive receptors would be significant and unavoidable.

San Bruno

4. *Laydown areas being considered for the construction of the LPA would not significantly alter the visual setting. (I)*

Selection of either Alternative A or C would not result in the removal of trees; these laydown areas would be greater than 200 feet from the nearest residence and would not obstruct significant views.

Selection of Alternative B would result in the clearing of some willow trees. This effect would be insignificant because these trees, located sparsely along some of the backyards of Belle Air residences that front onto 7th Avenue, do not contribute significantly to prominent views or streetscapes and were not identified as scenic resources. Alternative B would be located in this area which is marked by overhead transmission lines and the PG&E Airport Substation and would be visible predominantly from Highway 101 and from the backyards of residences along 7th Avenue. In this context, visual impacts would be insignificant.

5. *Construction of a temporary shoofly would temporarily alter the visual setting east of Huntington Avenue but would not occur within 60 feet of sensitive receptors; there are no significant views or well-defined streetscapes, and the SFIA property west of Highway 101, identified as a scenic resource, would not be affected. (I)*

6. *Construction of the cut-and-cover segment between San Bruno Avenue and the Tanforan Station would constitute a noticeable change in the visual setting in the Belle Air and San Bruno Park neighborhoods but would not block significant views or scenic resources, nor affect well-defined streetscapes. However, this construction, along with widening Huntington Avenue south of the proposed Tanforan Station, would occur within 60 feet of homes along Huntington Avenue in the Fifth Addition neighborhood and would result in a perception of encroachment. (S)*

MITIGATION MEASURES. No feasible mitigation exists to reduce impacts to sensitive receptors. The construction-period impacts to sensitive receptors would be significant and unavoidable.

Aerial Wye-Stub to the SFIA

7. *Scenic resources, including the open space area west of Highway 101 and identified travel corridors with high-quality streetscapes, would be impacted by construction activities. (S)*

   Construction activities for the aerial tracks would detract from views of the open space area west of Highway 101 and San Bruno Mountain from the Lomita Park and Marino Vista neighborhoods.

   MITIGATION MEASURES. No feasible mitigation exists to reduce these impacts to scenic resources and views. These construction-period impacts would therefore be significant and unavoidable.

San Francisco International Airport

8. *Construction of the aerial station would not adversely affect the visual setting of the SFIA property. Although construction activities would alter the visual setting within the International Terminal, SFIA expansion construction would already be ongoing. No significant views, scenic resources, sensitive receptors, or well-defined streetscapes exist within this area. (I)*

Millbrae

9. *Construction of the Hillcrest Boulevard grade separation would occur within 60 feet of sensitive receptors in the Millbrae Manor and the Bayside Manor neighborhoods. (S)*

   Hillcrest Boulevard would be grade separated to pass below the BART and CalTrain tracks. This project would be within 60 feet of sensitive receptors, who may sense an encroachment of privacy during construction.

   MITIGATION MEASURES. No feasible mitigation exists to reduce impacts to sensitive receptors. The construction-period impacts to sensitive receptors would be significant and unavoidable.

10. *Construction of the at-grade Millbrae Avenue Station and parking structure would noticeably alter the visual environment. This change would, however, not affect significant views, scenic resources, sensitive receptors, or streetscapes. (I)*

    Sensitive receptors in the Bayside Manor neighborhood would be greater than 60 feet from construction work areas, and no significant views or scenic resources are visible from Millbrae Avenue or adjacent streets. The streetscape along Millbrae Avenue lacks continuous facades and pedestrian-scale features and is auto-oriented. Consequently, construction activities at the Millbrae Avenue Station would not be expected to have significant visual impacts during the construction period.

Burlingame

11. *The at-grade turnback/tailtracks and enclosed inspection pit would not affect significant views, scenic resources, streetscapes, or sensitive receptors. (I)*

    Land uses adjacent to the proposed tailtracks are predominantly industrial. More sensitive visual sensitive receptors lie west of the CalTrain tracks and would be screened from much of the

construction activities by existing trees. Because of these conditions and the fact that CalTrain already travels through this area, the construction of 1,500 feet of tailtracks and other ancillary facilities would not significantly alter the visual setting.

Cumulative Analysis

The projects comprising the cumulative construction impact analysis within the project corridor, in addition to BART, include SFIA expansion plans, the Hickey Boulevard extension to Highway 101, and the El Camino Corridor redevelopment project. If construction activities associated with the Hickey Boulevard extension and the redevelopment project were to occur simultaneously with the construction of the BART alignment and Hickey Station, the cumulative result would be a marked contrast with the existing visual setting in South San Francisco. However, since streetscapes are not well defined or pedestrian oriented, there are no sensitive receptors within 60 feet, and significant views and scenic resources would not be disturbed, simultaneous construction of the projects would not constitute a significant impact.

Construction of the SFIA development may occur concurrently with construction of the BART extension. Cumulative visual effects from BART and the SFIA expansion would be noticeable from higher elevations to the west, but the views are so distant that the visual effects of this activity on the overall views would be insignificant.

Cultural Resources

Significance Criteria

Construction of the BART extension would result in a significant project-specific or cumulative cultural impact if it physically damaged paleontological, prehistoric, or historic archaeological resources of scientific value and educational/aesthetic/cultural value to the community and to Native Americans, or a property of historic or cultural significance to a community or an ethnic or social group. It would also cause a significant effect if construction impacted the integrity of a property eligible or potentially eligible for the NRHP.

Project-Specific Analysis

1. *During construction, paleontological resources may be disturbed. However, since these deposits are neither significant nor unique, their loss would not constitute a significant impact. (I)*

   Fossiliferous deposits may be disturbed during the construction period. This effect is not considered significant because the disturbance would occur almost entirely in the Colma Formation, where there is low to moderate potential of encountering commonplace fossils. In contrast, there is a high likelihood of encountering paleontological resources during construction activities in the deeper Merced Formation. These deposits include predominantly Gastropoda (snails) and Bivalvia (clams, oysters, scallops, etc.). Because these deposits occur throughout the Merced Formation and are not unique, disturbance by BART construction activities would not be considered significant.

2. *Based on current information and research, construction would not have an effect on a large shell midden known to have existed along Colma Creek. There may, however, be impacts to cultural resources that are encountered unexpectedly. (I)*

Background archival research for the DEIR/SDEIS did not locate or discover any structures or sites of significance to Native American ethnic or religious values. Similarly, surface inspection of the portions of the project corridor previously unsurveyed did not identify any surface indications of prehistoric cultural resources.

The alignment of the BART extension follows Colma Creek through portions of South San Francisco. This area was once known to contain a large shell midden. Because surface testing as part of the DEIR/SDEIS did not uncover any archaeological remains, and archival research indicated that the integrity of the site has been completely destroyed, no known archaeological remains would be disturbed by the proposed BART extension. The SHPO has determined that the site is disturbed and is not eligible for the NRHP.

MITIGATION MEASURES. Although no significant subsurface cultural resources have been identified, the following mitigation measure is recommended should cultural resources be encountered.

2.1 *Archaeological Testing and Compliance with SHPO Procedures.* For CA-SMA-299 and for all construction sites, construction personnel would be provided with information about the basic characteristics of archaeological deposits and Native American artifacts. Contractors will be told to cease earthmoving activities if these resources are identified during construction. If any cultural remains are uncovered, work within 10 feet of the resources will be stopped immediately, a qualified archaeologist will be retained, and actions (as stated on page 13 of the Archaeological Resources Report prepared for the BART-San Francisco Airport Extension) will be implemented. These actions are summarized below:

- Appropriate authorities (such as the local coroner, in the case of human burials) and a (Society of Professional Archaeologists) SOPA-qualified archaeologist will be retained to investigate the site's potential archaeological value.
- Mitigation of the cultural resources may include monitoring of further construction and/or systematic excavation of the remains.
- Cultural materials collected as part of the discovery, monitoring, or mitigation phases must be properly conserved, catalogued, analyzed, evaluated, and curated according to current archaeological standards set by the State Historic Preservation Officer.

3. *Construction of the subway would result in temporary removal of landscaping but would not disturb structures and monuments at the cemeteries in Colma that are eligible for inclusion in the National Register. (I)*

The proposed BART extension would follow an old Southern Pacific right-of-way through the Colma cemeteries. This right-of-way was used until mid-century as an active railroad line. Currently, the former right-of-way is a continuous, approximately 60-foot vacant swath through the cemeteries. Portions of this right-of-way are still owned by SPTCo; ownership of some of the former right-of-way has been transferred to the adjacent cemeteries. BART would purchase this right-of-way, which traverses the west side of the Home of Peace, Hills of Eternity, Cypress Lawn, and the Holy Cross cemeteries, along with adjacent strips of cemetery property. The alignment would be built in a box subway, with the top of the box located about 10 feet below the surface, in order to accommodate utilities and landscaping.

In addition to the right-of-way acquisitions, temporary subsurface construction easements would be needed, which would extend up to 50 feet on either side of the right-of-way. Access easements

would generally follow existing roads. Construction easements would come close to or be located underneath some structures in the cemeteries. Construction would occur as close as 10 to 15 feet from some structures in these cemeteries. However, BART construction has been successfully performed within such limited construction easements in the past. Standard construction techniques to secure adjacent soils or subsurface structures would be applied. These techniques include placing tiebacks to hold open earth areas in place within the subway cut; placing underpinning columns to support structures while excavating underneath; and providing shoring or braces to a structure above surface as additional support during activities that may cause earth movement or vibration.

Some existing vegetation, including trees and landscaping, would be removed as part of construction and replaced after construction is complete. No permanent or long-term impacts to the historic setting or structures in the cemetery districts are anticipated, since the project would be underground. After construction, the surface would be restored and the subway would not be visible. The construction time through these districts is estimated to be one year at any one area of the districts.

Of particular concern in the DEIR/SDEIS was the possible alteration to the Cypress Lawn gate. The construction of the subway box was aligned fairly close to the gate's foundations, and there was a concern regarding its structural integrity. Further engineering/alignment refinements subsequent to release of the DEIR/SDEIS show the subway would be 30 feet from the gate. To protect the gate footings, BART and SamTrans will enter into pre-construction agreements to install monitoring instrumentation to closely assess any settlement that may result from construction activities.

The proposed project would create temporary construction effects such as dust, truck movement, noise, vibration, and some visual and other nuisances within the cemetery districts. There would be no removal of the more aesthetic landscaping in areas intentionally included in cemeteries for contemplative activity, and any landscaping removed for construction would be replaced. The majority of the vegetation required for removal are unattended trees and brush in portions of the cemetery properties used for storage, maintenance, staging of construction work, commercial business leases, etc.

Less than approximately half the construction area would be visible from the adjacent street (El Camino Real) or active cemetery areas. Particularly for the Home of Peace and Holy Cross cemeteries, the BART construction area is shielded from burial sites and active cemetery uses by an adjacent embankment. In addition, a Memorandum of Understanding among BART, SamTrans, and each cemetery will be developed to specify construction practices and procedures prior to construction.

MITIGATION MEASURES. The following previously identified measures apply to this impact and would reduce this potential impact to an insignificant level: Mitigation Measure 2.1, i.e., landscaping, described in Section 3.3, Visual Quality; Mitigation Measures 1.1 and 2.1 in Section 3.13, Construction/Noise and Vibration, i.e., compliance with noise and vibration limits; Mitigation Measures 2.1 and 5.2 in Section 13.3, Construction/Geology, Soils and Seismicity, i.e., design for dewatering-related settlement of adjacent structures, and a monitoring program; and Mitigation Measure 1.6 in Section 3.13, Construction/Air Quality, i.e., use of best construction practices.

4. *The LPA would not adversely affect the physical setting of the Salem Memorial Park office, a structure eligible for National Register listing. (I)*

Based on the application of significance criteria, construction of this project would have no effect to the Salem structure and no permanent impacts to qualities that make it eligible for the National Register. Because the project would be permanently located underground, and restoration of adjacent grounds would occur after construction activities, no long-term or significant alterations would occur that would diminish its association with the cemetery industry in Colma in the 1930s (Criterion A) or its distinctive architecture (Criterion C). Construction activities would create temporary impacts to the open space adjacent to the building. Protective and restorative measures would be included as part of BART's standard construction specifications.

Without mitigation, operation of BART service adjacent to the office would generate groundborne vibration in excess of the established criteria. This vibration may be perceptible as a low-pitched, rumbling noise. The established thresholds for groundborne vibration are based on perception levels and are far below a level that could cause physical damage to a structure. Consequently, the BART-generated groundborne vibration at the Salem Memorial Park office would introduce a slightly perceptible noise into the setting, but this vibration would in no way threaten the features under which this structure qualifies for inclusion in the NRHP.

5. *The construction right-of-way encroaches as much as 35 feet into the Lagomarsino Farm District. (I)*

During preparation of the FEIR/FEIS, the SHPO determined that there was insufficient documentation to find the Lagomarsino District eligible for inclusion in the NRHP. Accordingly, the farm district is not a significant historic resource.

Furthermore, the impacts that have been identified are insignificant. The BART subway box would be located a minimum of 10 feet from the back of the property line. Even at the minimum 10 foot distance, there is sufficient area for construction activities to take place without affecting the Lagomarsino property itself. The structures which comprise this district are located 30 to 100 feet from the rear property line; thus, all structures would be at least 40 feet away from BART construction activities. Construction nuisances, such as noise and dust, would temporarily occur adjacent to this property.

Because the Aerial Design Option LPA would be located below the surface in this area, the undertaking would not result in any permanent changes to the setting of the district. The area behind this district is industrial in nature, so the addition of construction would not affect the setting of the district.

MITIGATION MEASURES. The mitigation measures identified previously would reduce this impact to an insignificant level. These measures include Mitigation Measures 1.1 and 2.1 in Construction/Noise and Vibration, i.e., temporary noise barriers and pre-drilled piles, and Mitigation Measure 1.6 in Construction/Air Quality, i.e., implementation of best construction practices.

Cumulative Analysis

The projects comprising the cumulative construction impact analysis within the project corridor, in addition to BART, include SFIA expansion plans, the Hickey Boulevard extension to Highway 101, and the El Camino Corridor redevelopment project. Since these areas in South San Francisco and on SFIA property are not known to contain cultural resources, it is not expected that cumulative effects would occur.

Community Services

Significance Criteria

Construction of the BART extension would result in a significant project-specific or cumulative impact if the construction activities caused a delay in police and fire department response times and created a hazardous situation. Local water and wastewater treatment providers would not be affected, since construction activities would require minimal water and generate little wastewater. Water would be required primarily for dust suppression. Demand for wastewater treatment is not expected to be significant; construction sites would be equipped with portable toilets that would discharge negligible wastewater into the sanitary sewer system.

Project-Specific Analysis

1. *Construction could delay response times for police, fire, and emergency medical service providers in Colma, South San Francisco, San Bruno, and Millbrae. (PS)*

   Construction activities would necessitate lane restrictions on local streets. Typically, half of the roadway would be closed, with two-way traffic provided on the other half. On major streets such as Mission Road, Chestnut Avenue, and Orange Avenue, two directions of traffic would be maintained during most of the construction period. The numerous public streets in the vicinity of San Mateo, San Bruno, and Angus Avenues would facilitate the detouring of traffic around construction areas in downtown San Bruno. BART will inform affected jurisdictions of proposed construction plans and road closures and work to achieve mutually acceptable traffic detour/rerouting plans. This will allow jurisdictions to develop alternate response routes. Although lane restriction is limited and traffic flows would generally be maintained, response times may be delayed during the construction period.

   Although an emergency vehicle entrance will be provided by BART through the Millbrae Avenue Station, construction of the alignment and the station would temporarily restrict movement along Millbrae Avenue, and access to the Bayside Manor neighborhood would be limited during construction of the Millbrae Avenue Station. These access limitations could slow emergency response during the construction period. Ultimately, upon completion of the grade separation at Hillcrest Boulevard, access to the Bayside Manor neighborhood would be improved.

   MITIGATION MEASURES. Implementation of Mitigation Measure 16.2 under Section 3.13 Construction/Transportation, i.e., coordination of vehicle routes with local jurisdictions, and Mitigation Measure 3.1 under Section 3.13 Construction/Land Use, i.e., coordination with cities, would reduce this impact, although it would remain potentially significant, especially for Bayside Manor.

Cumulative Analysis

The main projects comprising the cumulative construction impact analysis within the project corridor, in addition to BART, include the SFIA expansion plans, the Hickey Boulevard extension to Highway 101, and the El Camino Corridor redevelopment project. If construction activities associated with the Hickey Boulevard extension and the redevelopment project were to occur simultaneously with construction of the BART alignment and Hickey Station and involve extensive road closures and/or detours, then construction-related cumulative impacts to police and fire departments in South San Francisco would be potentially significant.

SFIA development may occur concurrently with BART and ALRS construction; however, the cumulative effect of the BART extension and SFIA construction on local police and fire departments would be insignificant because the SFIA project area is served by SFIA police and fire departments. On the other hand, the cumulative construction effects would be potentially significant for the SFIA police and fire departments.

BART will inform affected jurisdictions of proposed construction plans and road closures and work to achieve a mutually acceptable traffic detour/rerouting plan to minimize potential delays to emergency response times. Nevertheless, impacts would remain potentially significant.

Utilities

Significance Criteria

Construction of the BART extension would significantly impact utilities if it interrupted sanitary sewer, stormwater drainage, natural gas, electrical power, communication, or potable water service and inconvenienced customers. These criteria apply to project-specific and cumulative analyses.

Project-Specific Analysis

1. *North of the proposed Tanforan Station, construction would not result in utilities service disruptions. South of the Tanforan Station, construction of the LPA could result in short-term disruptions to utility services during relocation of utilities. (S)*

   Utility lines and facilities intercept or run alongside the proposed alignment within the construction right-of-way at numerous locations, creating potential conflicts between continuous customer service and construction activities. These conflicts most often occur where the project alignment crosses a road or an intersection, since most affected utilities are located underground below roadways.

   Whether disruption would occur depends on two factors: 1) the type of utility impact, and 2) the presence or absence of "loops" in the system. As described in the construction scenario section, these conflicts could be handled in one of several ways: utility lines and facilities could be horizontally relocated away from the alignment, raised or lowered to avoid rail line structures, supported or left in place during construction, or avoided altogether. Where a horizontal or vertical relocation would be required, noticeable service disruption could occur; supporting or leaving a line in place or avoiding it would not disrupt utility service, except where a high-pressure gas or high-voltage electrical line would create a substantial risk of explosion. The potential for disruption

exists when the replacement line is being "tied in" to the older segment of line remaining in place. At this time, it becomes necessary to disconnect the portion of the line being replaced from the system, thereby allowing connection of the replacement line. This process typically takes from a few seconds to as long as one or two hours.

Avoidance of service interruptions during reconnection would be possible by using alternate service routes, or "loops." These loops, which are built into most utilities in most service areas, provide flexibility in utility systems so that, if one line were out of service, an alternate service line could be utilized until normal conditions resumed.

This preliminary assessment of utilities impacts indicates that the majority of the utility work would be performed without interrupting service to utility customers. Some customers, however, could experience service interruptions during construction. While these interruptions would generally be limited to an hour or two at most, they would still be considered significant impacts.

Regarding specific utilities, no significant impacts would occur to storm drainage facilities because construction work would be scheduled to occur during the dry season when these facilities would be in low demand or the facilities would be maintained unobstructed or flows would be pumped from a diversion point to a downstream location. Work on sanitary sewers would not interrupt service, since any flows that occurred during utility relocation would be pumped and diverted past the affected line until the relocation work is complete. Water, power, and gas utilities generally have loops in the system, which would allow construction-related utility work to proceed without service disruption.

Because portions of the Aerial Design Option LPA alignment from the Tanforan Station to Millbrae would be in cut-and-cover subway configuration, which affords opportunity to leave or support utility lines and facilities in place, it is possible that utility service disruptions would not occur in these areas.

Since the aerial BART tracks would conflict with PG&E's existing 115 kV overhead transmission lines, the lines would have to be relocated. To accomplish this while the aerial wye-stub is being constructed, PG&E would erect new tubular poles to raise the PG&E lines.

MITIGATION MEASURES. Implementation of the following mitigation measures would reduce the impact of utility service interruptions to an insignificant level.

1.1 *Timing of Service Disruption.* To the extent possible, utility work will be coordinated in a manner that does not disrupt service.

1.2 *Temporary Backup Service.* If it is not possible to avoid service interruptions, the responsible utility will arrange alternate means of providing service, if feasible.

1.3 *Customer Notices*. Whenever possible, "residential notices" could be mailed/delivered to inform residents of upcoming activities, delays, or other construction-related issues.

Cumulative Analysis

Projects with a potential to have cumulative effects on utilities during construction of the BART extension include the El Camino Corridor redevelopment project, expansion plans at the SFIA, and other development within the project corridor related to growth projected in local and regional general plans (as

forecast in ABAG's *Projections '94*). The Hickey Boulevard extension would not likely cumulate with the proposed project, due to the timing of the Hickey extension. However, if construction of any one of these projects were to occur concurrently with construction of the BART extension, more customers could be affected by utility service interruptions in the vicinity of the project corridor. The impact of these cumulative projects would therefore be potentially significant. However, at any given location, it is unlikely that an individual customer would be affected by more than one construction project, due to the configuration of most utility lines, which incorporate "loops" into the system to provide service from alternate routes. The same mitigation recommended for the project-specific impacts, listed above, also applies to cumulative impacts and would reduce these impacts to an insignificant level.

Geology, Soils and Seismicity

Significance Criteria

The proposed project would result in significant project-specific or cumulative construction impacts if it would expose people or structures to major geologic hazards, including earthquakes, landslides, mudslides, ground failure, or similar hazards such as settlement and ground shaking.

Other potential significant impacts, such as alteration of landforms that substantially changes the topography or ground surface relief features, and creation of ongoing erosion or unstable geologic conditions that would last beyond the construction period, are not anticipated. Construction impacts would be short-term and would not alter landforms or create long-term erosion.

Project-Specific Analysis

1. *Whenever excavations occur below the water table, groundwater can disturb the excavation site as a result of seepage through the sides of the excavation and by an upward force from artesian water pressure on the bottom of the excavation. (S)*

   Perched or shallow groundwater may be encountered in the excavations for the cut-and-cover subway sections of the alignment from the Colma Station tailtracks to just south of the San Bruno CalTrain Station, from Center Street to just north of the Millbrae Avenue Station, and in the excavations for Hickey and Tanforan Stations. Encountering groundwater may cause slope instabilities during excavation and disturbance of the bottom of the excavation.

   MITIGATION MEASURES. The following mitigation measure would reduce this impact to an insignificant level.

   1.1 *Dewatering and Groundwater Control of Excavation.* BART will require construction contractors to design and implement a temporary dewatering system during excavation and construction of structures which extend below the groundwater level. A pump test will be performed prior to construction to provide data to design the dewatering system. The method and extent of dewatering would be influenced by the level of groundwater encountered during construction. There are three basic methods of controlling groundwater: open pumping, predrainage, and cutoff and exclusion. Open pumping would be effective in shallow subgrades (no more than a few feet below the water table) and in stable soils such as dense clayey sands, firm clays, or fissured rock. However, loss of soils due to open pumping may cause damage to existing structures nearby. Where conditions are not favorable for open

pumping, the water would be lowered in advance of the excavation by the use of wells, wellpoints, or similar methods. Medium to coarse sands are best-suited for conventional wellpoints, while fine-grained, pervious soils may be dewatered by vacuum wellpoints. However, wells and wellpoints would be installed with suitable screens and filters, so that pumping of fine soil particles, which can result in settlement of the ground surface, does not occur. The water level would be maintained at least 2 feet below the bottom of the excavation until the structure is constructed and its weight is sufficient to resist buoyancy. The dewatering system would also collect and remove surface water and rainfall.

A potential impact of this measure is that the collected groundwater would need to be disposed of in storm drains or other facilities. Prior to discharging water into city storm drains during construction, BART will complete a Stormwater Pollution Prevention Plan (SWPPP) as a condition of approval for a building permit, which is issued by the City of South San Francisco Department of Public Works. For discharge of water into city sanitary sewers, a permit is required from the City of South San Francisco Water Quality Control Plant.

If the groundwater is contaminated, disposal will be handled in accordance with guidelines of the agencies overseeing groundwater quality (see subsequent discussion under Construction/Public Health and Safety for recommended mitigation).

2. *Lowering the groundwater level by dewatering the excavations for the cut-and-cover subway sections of the alignment from the Colma Station tailtracks to just north of Millbrae Station, and in the excavations for Hickey and Tanforan Stations, would result in settlement of areas immediately adjacent to the excavations. Adherence to BART design criteria would reduce this impact to an insignificant level. (I)*

   Whenever the water table is lowered, the effective weight of the material between the original and final position of the water table increases from that of submerged soil to that of moist or saturated soil. If compressible soils (such as peat, organic silt, loose sands, or soft clay) are present, this weight increase can cause a settlement of the ground surface that is roughly proportional to the descent of the water table. Dewatering-induced settlement could cause damage to structures, pavements, and utilities adjacent to the excavations. The extent of settlement depends on the thickness and consolidation characteristics of the compressible deposit, the depth of drawdown, the duration of dewatering, as well as the construction type and the type of foundations of structures within the zone affected. Cut-and-cover subway sections of the alignment between the Colma Station just north of Millbrae Avenue Station, and in the excavations for Hickey and Tanforan Stations may experience settlement of areas immediately adjacent to the excavations.

   Dewatering-related settlement is expected to be minor for excavations in the Colma Formation because these soils typically consist of dense sands, but is expected to be larger for excavations in the vicinity of the SFIA, where soft, compressible clays (Bay Mud) and loose, artificial fills are known to exist.

   BART's design criteria contain guidelines for dewatering required for construction of permanent and temporary work. Section 7.4.1 of these criteria states that the design should be such that dewatering during construction of the permanent and temporary work is kept to a minimum. At the completion of the work, the groundwater should be able to reestablish its former level without

detrimental effects. Adherence to these criteria will minimize potential settlement effects to acceptable levels.

3. *As excavations occur for below-grade segments and facilities i.e., the cut-and-cover subway sections of the alignment from the Colma Station tailtracks to just north of Millbrae Station, and in the excavations for Hickey and Tanforan Stations, lateral ground deformation and settlements may occur behind the excavations. Adherence to BART design criteria, in conjunction with a monitoring program during construction, would reduce this impact to an insignificant level. (I)*

   Depending on the type of excavation shoring system, construction practices, and effectiveness of any tiebacks, the zone of influence behind the excavation i.e., the area within which excavation-induced settlements may occur) can extend up to about 2-1/2 times the depth of excavation. Excavation-induced settlement could cause damage to buildings, pavements, or utilities located within the zone of influence of the excavation. For the Aerial Design Option LPA, this zone would include excavation just north of the Millbrae Avenue Station and excavations for the Hickey and Tanforan Stations.

   BART's design criteria include considerations for settlement and movement of retaining walls in excavations. Section 7.4.1 of these criteria states that the design should include estimates of settlement and lateral movement of the retaining wall, fill and underlying soil. The design criteria require that the expected settlement and movement be limited to a magnitude which will not cause damage to the retaining wall or any superimposed or adjacent structure. Accordingly, significant ground deformation and settlement would not be expected during construction.

   MITIGATION MEASURES. In addition to the existing BART design criteria related to settlement and movement of below-grade structures in excavations, the following mitigation measure would be necessary to ensure that ground settlements do not exceed acceptable limits.

   3.1 *Monitoring Program During Construction.* BART will require that a monitoring program be established and performed to determine the effects of the construction on adjacent streets, utilities, and buildings. Additional shoring or bracing would be required for large movements i.e., settlements consistently larger than have been observed in connection with similar excavation projects under similar soil conditions).

4. *Construction of the aerial support columns across SFIA property could require pile driving, but would not result in geology, soils or seismicity impacts. Geotechnical exploratory methods are unobtrusive and would cause little or no ground disturbance. (I)*

Cumulative Analysis

The cumulative impact study area consists of the northern half of San Mateo County, from the Town of Colma to the SFIA. In addition to the BART extension, other pending projects within the study area are the El Camino Corridor redevelopment project and SFIA expansion plans.

Geologic impacts during construction are very localized and would not cumulate with other projects, unless those projects occurred in the same vicinity and around the same time. Geologic impacts of settlement and erosion during construction of the El Camino Corridor redevelopment project could cumulate with those for the BART project in the area of the proposed Hickey Station, if construction of

both projects occurred at about the same time. Similarly, cumulative settlement and erosion impacts could occur under the Aerial Design Option LPA in conjunction with the SFIA expansion.

Grading operations and site preparation for individual projects would be performed, in accordance with the specifications in the geotechnical mitigation reports typically required as part of the development review process. This measure would reduce the possibility of cumulative impacts by assuring, for example, that engineered fills are placed and compacted, temporary and permanent slopes are constructed, excavations are shored, and dewatering methods are used, per the geothechnical mitigation reports. To minimize erosion during construction, contractors would be required to submit erosion and sedimentation control plans and implement those plans during construction. The BART design criteria, Uniform Building Code, and other applicable codes, such as occupational Safety and Health Administration (OSHA) standard regulations for excavations, would be adhered to during construction. Therefore, no additional measures would be required to mitigate potential cumulative impacts.

Biological Resources

Significance Criteria. The following construction-related impacts would be significant biological effects:

- Any impact to state or federally listed endangered, threatened, or rare species, their habitats (such as breeding areas, travel or migration routes, and buffer areas), and/or plant or animal taxa that are otherwise protected under federal or state statutes;
- Any impact to a high-quality or undisturbed biological community, vegetation community, or wildlife habitat that is restricted, such as wetlands in the State of California or in the San Francisco Bay region; and
- Any impact to biological resources recognized by the scientific community as having important scientific interest because of unusual variation or physical or geographical limits.

Impacts addressed in this section are directly related to construction activities. The types of construction activities and schedules addressed in this section are generally based on the Construction Scenario Report prepared by Bay Area Transit Consultants (BATC, 1993). Since many of the impacts and mitigation measures would be similar for construction of both the mainline and the aerial wye alignment, this section does not distinguish between construction impacts on these two line segments. However, those impacts associated with only one of these alignments are identified in the text. This impact assessment is separated into pre-project construction and project construction activities.

Project-Specific Analysis

Preconstruction Period

1. *The preconstruction geotechnical field investigations would temporarily disturb approximately 0.28 acres of potential SFGS upland habitats on or in the immediate vicinity of the west of Bayshore parcel. (S)*

   BART must conduct exploratory soil borings and cone penetrometer tests to obtain soils information to properly design the foundations for the aerial structure and the mainline alignment. Design of the structural foundations in the area between the CalTrain mainline and Highway 101 (west of Bayshore parcel) is especially important because of the liquefaction potential of the loose, alluvial soil upon which the aerial structure would be built (see Section 3.13, Construction/

Geology, Soils and Seismicity, in this chapter, for more details). The proposed field investigation program has been designed to minimize the number of test sites, to the greatest extent possible (45 in total), and to avoid all wetlands and other waters of the U.S.

Each exploratory soil boring would be 8 inches in diameter and approximately 100 feet deep. The drilling equipment would be mounted on a single-axle, four-wheel-drive truck; a smaller water truck or trailer would also be necessary. This heavy equipment and associated construction materials (plywood staging, plastic ground cover, etc.) would cover an area of approximately 10 x 30 feet (approximately 300 square feet) at each drill site. The 4 proposed soil boring locations on the west of Bayshore parcel in the second phase would temporarily disturb approximately 1,200 square feet, or 0.03 acres, of potential upland SFGS habitat. Additional impacts to upland areas would result from off-road vehicle access to and from specific test sites. Each boring is expected to be completed within six to eight hours, and the entire field investigation in this area is not expected to take longer than 4 days, barring adverse weather conditions or other unanticipated delays. Noise levels associated with this activity would be similar to those produced by a small backhoe or tractor and would occur for a majority of the time that the soil boring was in progress at the planned test sites.

Subsurface soil samples would be taken at selected times during the soil boring process. The sample tube would be driven into the soil with a hammer device and result in noise levels similar to those of a sledge hammer striking a metal plate. All excess drill cuttings would be collected and disposed offsite. Some of the bore holes would have polyvinyl chloride casings installed for monitoring groundwater. Upon completing the testing and groundwater monitoring, all holes would be backfilled to the ground surface with cement/bentonite grout.

The cone penetrometer test holes would be 2 inches in diameter and approximately 100 feet deep. The test equipment would be mounted on a vehicle similar to the one described above; however, the noise produced by this piece of equipment would be somewhat lower (equivalent to a standard small truck), and each test would require no more than one hour to complete. These tests would be conducted during the same time period as the soil boring tests. A minimum of 4 cone penetrometer tests are planned for the aerial wye alignment on the west of Bayshore parcel. The total area of ground disturbance at each test site would be slightly smaller than at the soil boring sites and is estimated at approximately 240 square feet. The 4 test sites would disturb approximately 960 square feet, or 0.02 acres, of upland habitat on the west of Bayshore parcel. As with the soil test borings, additional impacts to upland areas associated with vehicle off-road access to and from the specific test sites would occur.

MITIGATION MEASURES. BART, in consultation with the USFWS and SFIA, divided the field investigation program into two phases. The initial first phase included 37 test sites that the USFWS determined were not likely to adversely affect the SFGS and red-legged frog. The USFWS authorized BART to proceed with the completion of these sites in the first phase in a letter dated January 9, 1996. BART has completed the investigations at these initial sites and continued consultation with the USFWS on the remaining eight test sites. The USFWS had initially determined these sites to be located in areas that were likely to adversely affect the SFGS and the California red-legged frog. The USFWS concluded its formal consultation on the eight test sites of phase two when it issued the Biological Opinion on May 20, 1996. The USFWS concluded that the proposed project including phase two of the geotechnical field investigations was not likely to jeopardize the continued existence of the SFGS or the California red-legged frog. The USFWS

assumed the project was completed with the mitigation measures noted below along with reliance upon to a list of reasonable and prudent measures designed to minimize the incidental "take" of these two species. The reader should refer to the BA and BO in Volume V for a more detailed description of the required mitigation measures. Implementation of these measures would reduce this impact to a less than significant level.

1.1 *Snake Proof (Exclusion) Fencing of Preconstruction and Construction Areas.* BART will exclude and remove SFGS from all preconstruction and construction sites in the following manner, or as modified by the USFWS. An exclusion fence will be constructed in accordance with similar exclusion/capture projects conducted elsewhere for wildlife research. The exclusion fence will consist of cyclone or plastic-mesh fencing material, with a 2-foot-tall drift fence of plywood or aluminum at the base. The fence will be buried at least 3 inches to prevent any SFGS from crawling under the fencing. Exit funnels will be placed every 50 feet along the fence line to provide exit points for those SFGS attempting to leave the enclosed construction site. The exit funnels will be constructed in accordance with a USFWS-provided prototype. Preconstruction and construction sites will be fenced for a period of at least six weeks between March and October 1, when the SFGS are most active, before being considered "unoccupied by SFGS." If, due to delays or unanticipated circumstances, SFGS must be excluded and removed from a construction site after September 1, the site will not only be fenced, but will also be watered with a sprinkling system to saturate the soils (without surface ponding) for one evening. One week after the initial watering, a second watering would occur over the entire site (1 to 2 inches, for one evening with no surface ponding). The purpose of this watering would be to saturate the soils and attract the snakes to the surface, where they could exit the construction area.

Once a site has been fenced and is considered unoccupied by SFGS, the fencing will remain in place throughout the construction period. In the case of the aerial wye stub the fencing will be removed after the temporary trestle is completed but before construction of the aerial wye stub begins to serve as an exclusion barrier and prevent any SFGS from re-entering the construction zone. Should a break in the fencing occur between March and October (or during a warm spell at other times of the year), the breach in the fence will be repaired immediately by the construction contractor. In addition, the construction site will be surveyed by a monitoring biologist. The monitoring biologist (see Mitigation Measure 1.2) would remove all SFGS found in the construction area, and construction activities would then be allowed to proceed. If the fence breach occurred in a wetland, then all construction activities in this area would be suspended, and the wetland would be trapped for a two-week period to remove any SFGS that may have been attracted to the area. Additional details for specific construction sites can be found in the Biological Assessment in Volume V of this FEIR/FEIS.

1.2 *Biological Monitoring Plan.* A Biological Monitoring Program has been developed and approved by the USFWS, SFIA, BART, and the geotechnical contractor (see the Biological Assessment in Volume V of this FEIR/FEIS). Elements of the Biological Monitoring Plan include:

- Identification of the required qualifications of the Biology Monitor.

- Identification of the responsibilities of all involved in the field investigation and monitoring effort. This would include a description of assignments, responsibilities, and reporting procedures in the event of a significant problem or potential problem (for example, if an SFGS is found, injured, or killed during the field investigation).

- Definition of acceptable operating procedures. These procedures would be designed to minimize disturbances from access and travel on the west of Bayshore parcel, disposal of waste, handling of fuels and water, and drill activities. The procedures would also address operational safety features, site security, and proper means of filling the holes.

- Description of an environmental awareness training program for the field crews to inform them of their responsibilities and the sensitivity of the resources.

- Definition of procedures for the environmental monitoring.

During the field investigations the Biological Monitoring Plan will be implemented.

2. *Relocation of the overhead PG&E transmission lines would result in additional disturbances to SFGS and red-legged frog habitats on the west of Bayshore parcel. (S)*

The aerial tracks crossing over the west of Bayshore parcel would cross under the existing PG&E 115 kV transmission lines. In consultation with PG&E, BART is recommending that the transmission lines be raised to allow the BART aerial structures to pass beneath. To achieve this, PG&E would erect five or six new steel tubular towers upon which the electrical lines would be placed between the aerial wye-stubs. In installing these towers, PG&E would require construction access into the wetland area between the BART aerial wye-stubs. Access through the wetland area would be provided by temporary steel or wood grating, timber mats or concrete-grate interlocking grid platforms on the tire tracks only. These measures would be removed during non-construction periods to reduce soil compaction and enhance wetland recovery after construction in this area was completed. The impacts of this activity are considered to be part of the long-term temporary impacts to a large wetland next to Highway 101 and will be mitigated as a permanent impact to sensitive species as discussed in Impact 8 below.

Construction equipment expected to be required for the erection of the tubular towers would include cranes, cement trucks, manual line trucks, and various supply trucks. The strengthening of the existing lattice towers immediately north and south of the proposed BART aerial wye-stubs would require a bucket truck and manual line trucks. Access to the construction sites would be via the existing paved and dirt access roads on the west of Bayshore parcel south to the Madrone Street gate entrance. Off-road access to specific construction sites would be from established access roads on the property and limited to specified locations. Depending upon when construction occurs, it may be necessary to temporarily improve the dirt roads leading to the construction site to all-weather roads by placing interlocking steel grid platforms on the dirt portion of existing access roads. This disturbance of the existing access road is not expected to last more than two months assuming the PG&E work begins in the fall months, as planned. This disturbance would temporarily impact approximately 0.41 acres of SFGS upland habitat (see Table 3.13-4 under Impact 8).

Because the transmission lines are the primary source of electric power to the north Peninsula area and the City of San Francisco and power cannot be interrupted for any extended period,

construction on these lines would allow only one circuit to be taken out of service (clearance) at any given time. Each pair of towers on each side of the BART alignment carries two circuits. The tower lines have to be built consecutively. Therefore, one pair of circuits on each tower line would have to be maintained on a temporary wood pole or shoofly line, next to and west of the existing PG&E right-of-way and along the existing dirt access road. The shoofly line is expected to be approximately 4,000 to 5,000 feet long. The shoofly line would be designed to avoid the placement of poles within wetland areas. Placement of the shoofly poles would require a standard PG&E vehicle with an auger drill. The placement and stringing of electrical lines on each pole would take approximately one-half work day (four hours) to complete.

Once the poles are up and the lines strung, PG&E would not have to access these sites for maintenance beyond what is now required for the existing powerlines. The shoofly would remain in place until the new towers and lines are in place and operational.

Total construction time for the relocation of the PG&E lines is estimated to be seven months. The construction of the shoofly would require one month and each tower line approximately two months to complete. The tower lines have to be built consecutively. Upon completion of the BART aerial structure through the west of Bayshore parcel, the shoofly line would be removed.

MITIGATION MEASURES. The following mitigation measure will reduce the identified impacts to an insignificant level. This mitigation measure is designed to minimize impacts to habitat during construction of the new transmission lines towers and to address restoration of wetland habitat after the towers are erected and the temporary access bed in the wetland and on the dirt roadways are removed.

2.1 *Sensitive Construction Techniques and Monitoring Efforts.* Many of the same mitigation measures identified for Impacts 1, 5 and 9 in this section, Construction/Biological Resources, are also appropriate for impacts associated with construction of the transmission towers (e.g., sensitive construction practices, such as restricted access routes; development and implementation of a wetland restoration plan; and the employment and use of a biology monitor). In addition, a Site Restoration Plan, including an active revegetation program and suitable soil erosion control measures, will be developed and implemented. Reclamation of the disturbed sites will be performed immediately after completion of project construction. A detailed Site Restoration Plan will be prepared before construction is initiated. Suitable mitigation measures associated with the long-term construction impacts to the seasonal wetland are discussed under Impact 9.

3. *Relocation of 12 kV underground power line would result in the excavation of upland habitat (480 square or 0.01 acres) on the west of Bayshore parcel. (S)*

A 12 kV underground power line requires to be relocation approximately 750 feet to the north of its current location where it crosses under Highway 101. The footings for the BART aerial structure would conflict with the current power line crossing under Highway 101. This relocation will require the excavation of a receiving pit approximately 25 x 18 feet and 15 feet deep and the extension of an existing manhole approximately 10 feet to the east of the west of Bayshore parcel. All necessary construction-related activities on the west of Bayshore parcel for this action will take place within a 70 foot wide by 100 foot long fenced area currently supporting upland habitat. The fence will be designed to serve as a barrier to SFGS, as per requirements defined by the USFWS.

The 70 x 100 foot construction area will not be cleared of all vegetation and access through the fenced area will avoid all existing coyote bushes within and outside the work area. All access to the work area will be via Highway 101 and thus avoid vehicle traffic through the west of Bayshore parcel. All excavated soil will be removed and stockpiled off the west of Bayshore parcel. The entire construction period will last three months, and the excavation hole will be backfilled. This action is considered a temporary impact to upland habitats of the SFGS.

MITIGATION MEASURES. The following mitigation measures will reduce this impact to an insignificant level as defined in greater detail in the Biological Assessment and Biological Opinion in Volume V of this FEIR/FEIS. These mitigation measures include Mitigation Measure 1.1 above, which provides more details on the SFGS exclusion fencing; Mitigation Measures 5.3 and 5.4, construction monitor, employment of sensitive construction practices; Mitigation Measures 6.1 or 6.2, sediment basins or tanks, slurry and/or sheet pile shoring walls for any required dewatering of the excavation site; Mitigation Measures 7.1 and 7.2, construction site watering, development and implementation of an erosion control plan for soil erosion; and Mitigation Measures 9.3 and 9.4, on-site habitat replacement, off-site compensation. In this case, the on-site habitat replacement ratio for this temporary impact would be 2:1 or 0.02 acres of upland habitat at the mitigation site west of CalTrain or 3:1 for off-site compensation or 0.03 at Steel Ranch or some other off-site location.

4. *Preconstruction activities would involve removal of trees within the construction easement and in the Alternative C laydown area. (I)*

   Nearly all eucalyptus trees east of the CalTrain tracks would be removed for the mainline tracks. Although these trees provide some habitat for nesting bird species, in particular raptor species, eucalyptus trees are not native to California and these trees preclude the development of undergrowth and more productive habitat. The only raptor bird species observed on the west of Bayshore parcel associated with these trees were a pair of red-tailed hawks (assumed nesting) and a sharp-shinned hawk in the winter. These bird species are common in the area, and the loss of this habitat for these birds is not considered significant. The removal of the trees may enhance the development of wetland vegetation along San Felipe Canal, which now has very little ground cover under the eucalyptus trees. The removal of these trees would have a visual impact, which is discussed in the Visual Quality section of this chapter.

   The removal of acacia trees west of the CalTrain tracks is not considered significant because these trees are also non-native and provide limited habitat value.

Construction Period

5. *Construction of the Aerial Design Option LPA would temporarily disturb all biotic resources within the proposed construction right-of-way, specifically wetlands and other "waters of the U.S." (S)*

   A construction right-of-way has been designed to allow for adequate work space as well as to minimize disturbances to sensitive biological resources. It is assumed that movement of construction equipment would occur throughout the right-of-way, except where otherwise specifically precluded; thus, construction activities would temporarily disturb wetland and creekside habitats that exist within the construction right-of-way.

The following discussion is taken from the Section 404 permit application that BART submitted to the U.S. Army Corps of Engineers (ACOE) in February 1996. Impacts described here differ from the 404 application as result of changes in project design made in response to comments on the 404 application. Design changes have reduced some impacts, as listed in Table 3.7-1. For added details, refer to the Section 404 Public Notice on the BART permit application in Volume V of this FEIR/FEIS.

Temporary construction impacts to areas of ACOE jurisdiction (waters of the U.S.) as a result of the proposed Aerial Design Option LPA would occur at six distinct sites: Colma Creek, Twelve Mile Creek, South Spruce Avenue, a drainage swale north of the San Bruno CalTrain Station, Cupid Row Canal, and various wetlands and other waters of the U.S. on and in the immediate vicinity of the west of Bayshore parcel. The location of each of these impact sites relative to the proposed project alignment is presented in Figure 3.7-5 and listed in Table 3.13-4. The temporary construction-related impacts to waters of the U.S. at each of these sites are described below.

Colma Creek. Colma Creek runs within a concrete-lined channel which has about a 10-year event flood capacity in the vicinity of the proposed project. There are no important biological values associated with the existing creek. Several modifications are proposed for the project reach of Colma Creek (approximately 5,400 linear feet) to provide 100-year flood protection while accommodating the proposed BART alignment. The proposed temporary construction modifications to this creek are described as follows:

- ***Diversion Structure*.** At a point immediately upstream of the project, a temporary diversion dam would be placed in the existing Colma Creek channel. The stream flow would be diverted around the construction area by pumping water into a diversion pipe which discharges back into the creek downstream of the project site, near Oak Avenue. Construction activities that would affect Colma Creek are expected to be completed in one six-month dry season (April 15 - October 15). Upon completion of construction within the creek, the diversion structure, pump, and pipe would be removed and the creek channel at the diversion dam site restored to pre-project conditions.

- ***Realignment and/or Widening.*** At several locations along Colma Creek, the existing channel is proposed to be realigned and/or widened to accommodate the project and to provide 100-year flood capacity (San Mateo County Flood Control District design criteria for Colma Creek). At these locations, portions of the existing channel would be filled and replaced with an enlarged, concrete-lined channel. Where the existing creek is to be realigned and/or widened, the area of fill placed in the existing channel would be balanced by the area of channel created to realign (widen) the new channel.

  These modifications to Colma Creek would not result in any net loss of wetlands or waters of the U.S.

Twelve Mile Creek. Twelve Mile Creek is currently a concrete-lined channel through the project reach south of Chestnut Avenue in South San Francisco. The proposed temporary construction modifications to the creek are as follows.

- ***Diversion Structure.*** A temporary diversion structure would be placed in Twelve Mile Creek at a point immediately upstream of the proposed construction site. The fill material

for the diversion structure would be selected by the contractor, but would be placed such that it would not create an erosion source. Possible fill material would be clean gravel or concrete in sand bags. The stream flow would be diverted around the proposed construction area by pumping water into a diversion pipe which discharges back into the creek downstream of the proposed construction site. The construction is to be completed in one six-month dry season (April 15 - October 15). Upon completion of the construction, the diversion structure, pump, and pipe would be completely removed, and the creek area where the temporary diversion structure is to be placed would be restored to pre-project conditions.

- *Box Culvert.* A 200-foot reach of Twelve Mile Creek would be temporarily disturbed to allow for the excavation and placement of the BART subway box and tracks. Once the BART subway is in place, the removed segment of an existing concrete box culvert would be replaced in kind and the existing concrete creek channel restored.

These modifications to Twelve Mile Creek would not result in any permanent impacts or net loss of jurisdictional area.

South Spruce Avenue. The area consists of a drainage channel between two culverts, paralleling Spruce Avenue, and a seasonal wetland which has developed immediately north and adjacent to the proposed BART alignment. The seasonal wetland is located in a depression between two former railroad alignments. The proposed BART subway would be constructed though this area utilizing cut-and-cover methods. Both the drainage channel and the seasonal wetland would be temporarily disturbed by this activity. Approximately 1,350 square feet (0.05 acres) of the open ditch and 11,000 square feet (0.25 acres) of the adjacent seasonal wetland would be temporarily disturbed and restored following construction of the subway segment. Flows in the drainage ditch would be diverted through a pipe during the six-month construction period in the dry season (April 15 - October 15).

A temporary diversion dam immediately upstream of the culvert headwall, upstream or west of the proposed BART alignment, would be placed in the drainage ditch. Upon completion of the construction, the diversion structure, pump, and pipe would be completely removed, and the creek area where the temporary diversion structure is to be placed would be restored to pre-project conditions.

Drainage Swale North of the San Bruno CalTrain Station. This area consists of a small ephemeral drainage swale between the CalTrain track alignment to the east and Huntington Avenue to the west. Located just north of the existing San Bruno CalTrain Station platform, the swale conveys stormwater from Huntington Avenue to a 24-inch culvert under the CalTrain tracks. Construction of the cut-and-cover section of the project would intersect this wetland. Prior to construction, a temporary submersible pump would be installed in the catch basin adjacent to Huntington Avenue. During construction, water would be pumped across the BART alignment to the east side and discharged into the existing 24-inch-diameter culvert located at the end of the drainage swale.

Approximately 375 square feet (0.01 acres) of the swale would be temporarily disturbed by the cut-and-cover construction of the BART subway alignment. The area temporarily disturbed would be restored in kind and in place following construction.

Cupid Row Canal. Affected areas along Cupid Row Canal consist of a portion of the canal in the west of Bayshore parcel to Huntington Avenue east of the CalTrain tracks, the proposed construction laydown area, and the laydown area access route. Cupid Row Canal flows in a northeasterly direction through a box culvert under Huntington Avenue. It then flows through an earthen channel and a railroad culvert and continues in a natural earthen creekbed to a culvert under an access road to the west of Bayshore parcel. From this point, the canal continues northeast in an open, earthen channel to Highway 101. The proposed temporary construction modifications to the canal and immediate area are as follows:

- ***Diversion Structure and Canal Realignment.*** A temporary diversion structure would be placed in the existing Cupid Row Canal immediately upstream of a culvert under the CalTrain tracks. The construction material for this diversion structure would be selected by the contractor, but would be placed such that it would not create an erosion source. Possible fill material would be clean gravel or concrete in sand bags. The stream flow would be diverted around the construction area by pumping water into a diversion pipe which discharges back into the creek downstream of the proposed construction site. The proposed BART track construction associated with Cupid Row Canal is to be completed in one six-month dry season (April 15 - October 15). Upon completion of the construction in Cupid Row Canal, the diversion structure, pump, and pipe would be completely removed.

  In order to maintain the creek invert elevation and because the original channel bottom would be too close to the top of the BART box, this portion of Cupid Row Canal would be relocated to the north. At the point where the canal exits the Huntington Avenue culvert, a new channel would be created, directing the flow approximately 75 feet north into two new 4 x 10-foot concrete box culverts constructed under the CalTrain tracks. It would then cross above the BART alignment through a new channel constructed after installation of the BART box. The flow would then enter two new 4 x 10-foot concrete box culverts under the entrance road and would be directed back into the original Cupid Row Canal east of the access road.

  The abandoned reach of the existing canal, including the railroad and access road culverts, would be filled, sloped to drain, and restored to match surrounding conditions. The amount of filled jurisdictional area within the existing channel alignments (approximately 2,660 square feet, 0.06 acres) would be nearly equivalent to the amount of new open channel habitat that would be created (approximately 3,100 square feet, 0.07 acres). The impacts to the ACOE 404 jurisdictional area would therefore be temporary and mitigated at the site when the project is completed.

- ***Tributary Channel.*** A tributary channel to the north of Cupid Row Canal would be temporarily diverted into a pump and pipe system by placing sand bags in the channel at the diversion point just outside the proposed BART construction zone. Flows within this channel would be pumped through a pipe to a discharge point in Cupid Row Canal downstream of the proposed BART construction area. The 330 linear feet (approximately 0.05 acres) of this tributary channel that would be disturbed during the construction of the BART underground tracks would be restored to its present condition and at its current location following completion of construction.

West of Bayshore Parcel. The proposed mainline and aerial wye-stub alignments on and in the immediate vicinity of the west of Bayshore parcel would impact San Felipe Canal, South Lomita Canal, and a large seasonal wetland next to Highway 101. These impacts are discussed below.

- ***Construction Laydown Area.*** Laydown area Alternative C is next to Cupid Row Canal on the west of Bayshore parcel. Two seasonal wetlands (approximately 0.04 acres) would be disturbed during use of this site as a laydown area, but they would be restored to pre-project conditions when the proposed project is completed.

- ***Access Road.*** An optional access route to the proposed laydown area would cross over Cupid Row Canal and connect with Highway 101. The existing 10-foot-wide dirt road along the entire access route would be widened to approximately 25 feet and improved to an all-weather roadway. This widening of the existing dirt road would require the placement of fill material in an adjacent seasonal wetland located just south of the point where the roadway would cross Cupid Row Canal. The roadway would be constructed on top of a matting material to reduce the amount of soil compaction and enhance the recovery of the wetland after completion of project construction. This action would temporarily disturb approximately 0.09 acres of seasonal wetland that would be restored to pre-project conditions after construction.

- ***Northern Aerial Wye-Stub.*** Construction of this segment of the proposed alignment includes a trestle construction bridge and footings for the aerial guideway.

  - ***San Felipe Canal, North.*** The proposed second footing of the northern aerial wye structure would be placed within San Felipe Canal. Approximately 0.013 acres of San Felipe Canal would be excavated for the placement of the footing but then reestablished at this site when construction is completed.

  - ***Temporary Trestle Construction Bridge.*** Construction of the aerial tracks of the wye-stubs over the west of Bayshore parcel would be from a temporary roadway consisting of a 40-foot-wide temporary construction trestle bridge along one side of each wye-stub segment. Construction of the temporary construction trestle would require the placement of temporary pilings into the soils. The trestle would be prefabricated and placed on the temporary pilings. The temporary piles for this structure would be approximately 18 to 20 inches in diameter. Each bent of the trestle would require two piers at each end, or a total of four piers. Each bent is assumed to be approximately 20 feet in length (the length would likely correspond to spacing of the stationary outriggers of the crane, such that the crane can support itself on the piers).

    The length of the temporary construction trestle needed to span the seasonal wetland west of Highway 101 is approximately 150 feet, requiring the placement of up to eight full bents over the wetland, or 32 piles, into the wetland. This action would result in the temporary disturbance of less than 0.001 acres of wetland habitat. This impact is considered to be part of the long-term temporary impacts to the large seasonal wetland next to Highway 101 and will be mitigated as a permanent impact to sensitive species, as described in Impact 9 below.

  - ***Aerial Wye Trackway Footings in Seasonal Wetland.*** The proposed aerial alignment would cross a large seasonal wetland next to Highway 101 and the point where

San Felipe Canal runs into the South Lomita Canal. Pilings for the construction trestle and footings for the aerial tracks would be the only points of disturbance on the ground surface along the aerial alignment on the west of Bayshore parcel. Construction of the aerial track footings would require excavating an area for of the aerial structure foundation, consisting of concrete caisson piles and a concrete cap. The area of excavation for each footing would have vertical walls with metal sheeting to shore up the walls. The use of metal sheeting would preclude the need to excavate the walls with slopes of 2:1 or 3:1 and would thus limit the area of excavation to the greatest extent possible. All excavating equipment would operate from the temporary construction trestle, and all excavated materials would be removed from the site and stored or disposed at an approved construction storage yard and staging area.

Two of the aerial structure footings would be located in one of the large seasonal wetlands west of Highway 101 and beneath the PG&E powerlines. The excavation surface area within the metal sheet piles for each of these footings would be approximately 33 x 38 feet, or approximately 1,250 square feet (0.03 acres). This would result in the temporary disturbance of approximately 2,500 square feet (0.06 acres) of habitat within this wetland. This impact is considered to be part of the long-term temporary impacts to the large seasonal wetland next to Highway 101 and will be mitigated as a permanent impact to sensitive species, as described in Impact 9 below.

- ***Southern Portal and Mainline Alignment.*** A concrete-lined channel west of the CalTrain tracks conveys stormwater east through two 60-inch-diameter culverts that cross under the CalTrain tracks into an unlined tributary channel that flows into South Lomita Canal. In addition, there is an unlined drainage ditch on the east side of the CalTrain tracks that conveys stormwater from Madrone Street to the unlined tributary channel noted above. These are the jurisdictional areas that would be impacted by the proposed BART extension project in this area.

  Retained cut of the southern tunnel portal of the mainline would intersect the east side of the existing 60-inch culverts under the CalTrain tracks, a portion of the unlined channel to South Lomita Canal, and the Madrone Street drainage ditch. The two culverts under the CalTrain tracks would be abandoned and filled in place with approximately 147 cubic yards of clean fill material. A portion of the unlined tributary channel would also be abandoned and is discussed in Section 3.7 as a permanent impact. The existing concrete-lined channel west of the CalTrain tracks would be routed to the north and would tie into the inlet for a new 5 x 8-foot reinforced box culvert under the existing CalTrain tracks and proposed BART tracks. The new concrete channel would be longer than the existing concrete channel, thus adding to the existing habitats onsite and mitigating this temporary impact.

  The drainage ditch from Madrone Street would be rerouted to the east next to the BART portal. The new rerouted earthen channel would be approximately the same width and length and area (0.03 acres) as the existing ditch and thus would mitigate onsite the temporary loss at this ditch.

- ***Southern Aerial Wye-Stub.*** One support footing for the southern aerial wye-stub would be placed in the far southern end of San Felipe Canal, where it empties into South Lomita

Canal. Sandbags would be placed at the confluence of the two canals to prevent water from backing up into the work area. The work area in San Felipe Canal would be excavated for a support footing and two columns for the southern aerial trackway which would temporarily disturb approximately 0.03 acres. The excavated volume would be replaced with concrete for the footing and east bank of the channel and with earth in the channel bottom. Since the channel is to be widened in this area, the temporary impact of the excavation would be balanced by the added jurisdictional area in the channel.

If flow conditions require, a temporary earthen dam would be placed on San Felipe Canal north of the aerial wye alignment to route the flow into a temporary bypass pipe around the construction site and into South Lomita Canal. The dam, if needed, would be completely removed upon completion of the project construction in this portion of San Felipe Canal and restored to pre-project conditions.

- *Mainline Construction Zone.* A 10-foot-wide construction zone along the mainline to San Felipe Canal would temporarily impact 0.1 acres of jurisdictional area, including two seasonal wetlands along San Felipe Canal and a portion of a tributary channel to South Lomita Canal.

MITIGATION MEASURES. The following mitigation measures implemented together would reduce the identified impacts to biotic resources, including wetlands and other "waters of the U.S.," to an insignificant level.

5.1 *Vegetation Clearing and Protection of Seasonal Wetlands.* BART will employ two means of minimizing construction-related impacts to the seasonal wetlands that are to be restored. First, any heavy equipment used in clearing woody vegetation within the wetlands along the mainline will be equipped with special, low-pressure tires or tracks to minimize soil compaction. Whenever possible and practicable, woody vegetation will be cleared by hand rather than by heavy equipment. This type of low-impact clearing will be most appropriate for the blackberry bushes along South Lomita Canal. Second, in the construction laydown area, a mat of geotextile fabric will be placed over the two small wetlands to further minimize native soil compaction and potential contamination during construction activities. A temporary working surface of gravel will be placed over the geotextile fabric and graded. After construction and testing, the gravel and fabric will be removed and the two wetlands restored. This means of minimizing impacts will be employed in all areas within the construction laydown area.

5.2 *Restoration of Disturbed Wetland Sites.* Wetland habitats within the construction right-of-way that cannot be avoided will be restored to their original topographic contours with the same topsoil removed from the area (if applicable), and then reseeded or revegetated with the same plant species found at the site prior to construction. This mitigation measure is appropriate for those drainage ditches that are to be relocated, and for all seasonal wetlands that will be disturbed on and adjacent to the west of Bayshore parcel.

Prior to construction, each potentially disturbed wetland site will be characterized by a wetland restoration biologist. The restoration biologist will collect information on the diversity and density of plant species at each site and provide a photographic record of the wetland prior to and during construction. In addition, the restoration biologist will monitor

construction activities and implement a restoration plan for each impacted wetland. The restoration plan will identify criteria to evaluate the effectiveness of the restoration effort, and indicate specific techniques to be used, and provide a schedule for the restoration efforts. The USFWS will need to approve the restoration plan prior to completion of construction activities occurring on the west of Bayshore parcel.

5.3 *Construction Monitor.* Throughout the preconstruction and construction period, BART will employ a construction monitor to guide and assure that the mitigation measures are implemented successfully. This person will have review authority over all planned construction activities and mitigation measures; monitor all construction activities in the field, and have authority to stop work if necessary; and serve as the liaison between BART, the resource agencies, and the construction contractor.

5.4 *Sensitive Construction Practices.* BART will require the construction contractor to employ sensitive construction techniques on the west of Bayshore parcel, including daily clean up of construction sites, adoption of fuels and liquid spill containment measures, rapid emergency response planning and implementation, and off-site refueling.

6. *Construction of below-grade portions would require the dewatering of excavation sites and the discharge of the excess water into surface drainages in the immediate vicinity. These discharges may have high concentrations of silt and sediments, which can degrade the quality of the aquatic habitats of the receiving waters. (S)*

MITIGATION MEASURES. Either of the following mitigation measures would reduce this impact to an insignificant level.

6.1 *Sediment Basins or Tanks.* BART will require that construction contractors construct sediment basins in upland habitats (avoiding all designated wetlands) immediately adjacent to the dewatered construction site but also within the designated construction right of way zone. All waters pumped from the site will first be discharged into these sediment basins, where silts and sediments can settle. The cleaner surface water from these basins will then be discharged into a surface drainage. The effectiveness of this mitigation measure will be carefully monitored and controlled in the west of Bayshore parcel, where the endangered SFGS and threatened California red-legged frog occur, to ensure that the aquatic habitats on this parcel are not adversely affected. If the use of these sediment basins proves to be inadequate in the control of sediment deposition in this area, then Mitigation Measure 6.2 would be implemented. Threshold criteria to define the efficiency of these sedimentation ponds would be defined in the erosion control measures of the SWPPP (see Section 3.13, Construction/Hydrology and Water Quality, for more details) and in consultation with the USFWS and ACOE.

6.2 *Slurry and/or Sheet Pile Shoring Walls.* Slurry and/or sheet pile shoring walls will be used at certain construction sites to avoid the need to dewater and discharge into adjacent drainages (see Section 3.13, Construction/Geology, Soils and Seismicity, for a more detailed discussion of where this type of construction would be appropriate). This method of construction is expensive and would only be used if Mitigation Measure 6.1 proved to be ineffective.

7. *Areas of surface disturbance would be subject to soil erosion by wind and water. The silts and sediments could be deposited in the adjacent aquatic habitats and thus could degrade these habitats. (S)*

MITIGATION MEASURES. The following mitigation measures would reduce the identified impact to an insignificant level.

7.1 *Construction Site Watering.* BART will require construction contractors to use watering trucks twice daily, or more often during the summer months, heavy construction, and earth-moving activities, to minimize dust and wind erosion.

7.2 *Erosion Control Plan.* BART will require construction contractors to develop and implement an Erosion Control Plan for each construction site. This plan will identify specific measures to be used to control soil erosion and sedimentation in adjacent waterways and/or wetlands during and immediately after construction activities. The Erosion Control Plan will also contain a monitoring program to evaluate the effectiveness of the control measures. This type of plan is required as part of an NPDES permit from the Regional Water Quality Control Board, and will need to be approved by the USFWS for construction sites on or in the immediate vicinity of the west of Bayshore parcel.

8. *Access points to construction areas would be required every 500 feet in areas with a narrow right-of-way (60 feet in width) and at 1,000- to 2,000-foot intervals in areas with a 110-foot-wide right-of-way. This requirement would result in the disturbance of additional areas outside the construction right-of-way zone. (S)*

The exact locations of these access points have not been delineated on the engineering plans and profiles, and thus specific impacts cannot be defined. However, the types of potentially significant impacts that may occur include the disturbance of wetlands.

MITIGATION MEASURES. The following mitigation measure would reduce the potential impact to an insignificant level.

8.1 *Limit Access to Alignment in Vicinity of Colma Creek.* All access to construction sites between the crossing of Mission Road and the crossing at Colma Creek will be from Mission Road rather than from El Camino Real (except at the proposed Hickey Station, which will be located on the El Camino Real side of the creek). This measure would avoid any unnecessary crossing of Colma Creek and need for bridging.

9. *Construction activities would disturb endangered species habitat and may result in a loss of individual members of sensitive species. (S)*

All of the proposed construction activities within and immediately adjacent to the west of Bayshore parcel would have an effect on the endangered SFGS, the threatened California red-legged frog, and the San Francisco forktail damselfly, and may result in the loss of individual SFGS and red-legged frogs. It is not possible to accurately predict the number of individual snakes and/or frogs that could be lost as a result of the proposed construction activities due to the elusive nature of the species in habitats that make detection difficult and their relatively small body size. Losses may also be masked by seasonal fluctuation in number. Consequently, it is best to evaluate the amount of habitat that is lost or becomes unsuitable in estimating impacts. The USFWS estimates in their

Biological Opinion that 12.5 acres of SFGS and California red-legged frog habitat will become unsuitable as a result of the proposed action.

Wetlands on and in the immediate vicinity of the west of Bayshore parcel are discussed in Impact 5 as ACOE jurisdictional areas; these same wetlands are also included in the following discussion as sensitive species habitat which would have potential indirect, direct, short-term (or temporary), and long-term (or permanent) construction impacts. Wetland areas that are impacted by construction and are also habitat to these sensitive species are listed in Table 3.13-4. All of the impacts defined below have been identified and described in consultation with the USFWS and are discussed in greater detail in the Biological Assessment and Biological Opinion in Volume V of this FEIR/FEIS.

Indirect Impacts. Potential indirect impacts to sensitive species habitat include reductions in food sources and noise and vibration disturbances that may harass individuals and/or interrupt behavior patterns or preclude the use of particular habitats for feeding, breeding, travel or cover. In evaluating noise impacts, one must consider the noise levels above the normal ambient levels has been considered for a given site, but also the tenure of the expected noise levels and the likely uses of adjacent habitats by the sensitive species. It should be noted, however, that the habitat areas on and in the immediate vicinity of the west of Bayshore parcel are currently affected by highway and aircraft noise.

Another potential indirect impact of construction is the temporary blockage of north-south corridors used by some SFGS. This blockage could result in the isolation of some SFGS in the northern half of the parcel, where in normal to dry years there is no permanent water or food source. The SFGS isolated in this area of the site could starve or seek other food sources, and thus be exposed to greater risks of predation or injury. Barriers to dispersal corridors may limit breeding opportunities for the SFGS. BART has proposed the use of the elevated construction trestle to minimize this potential impact. By elevating the construction area above ground, wildlife species including the SFGS and California red-legged frog can move more freely throughout the west of Bayshore parcel. This also avoids direct impacts to densely occupied habitat.

Specific habitat areas which may be indirectly impacted by construction are discussed below.

- **Northern Portion of Seasonal Wetland Under Aerial Wye Stub.** Significant construction noise and vibration impacts to the three sensitive species on the west of Bayshore parcel are defined as those of long duration (greater than six months) and near wetland habitats (habitats where all three species may occur) of sufficient value that construction could degrade these habitats. One such habitat area in the northern portion of a seasonal wetland just west of Highway 101 where the northern aerial wye stub would be constructed may be indirectly impacted by construction noise and vibrations. Although none of this approximately 0.16 acres of wetland habitat would be directly disturbed, the construction activities associated with the reconfiguration of the PG&E lines and the construction of the BART aerial wye stubs would make the remainder of this habitat of limited value to the SFGS and possibly the California red-legged frog.

- **Temporary Construction Trestle.** Although the proposed temporary construction trestle would span the west of Bayshore parcel and thus minimize the potential blockage of the north-south travel routes of the SFGS, the noise levels and activity levels expected on this structure throughout the construction period may limit some SFGS movement. This

Table 3.13-4
Estimated Area of Wetlands
Temporarily Impacted by Construction Activities

Impacted Site[1]	Construction Activity	Area of Temporary Impact (Acres) Short-Term Impacts[2]	Long-Term Impacts[3]	Habitat for San Francisco Garter Snake[4]	Proposed Mitigation Ratio[5]
1. *Colma Creek Diversion* (Site 1-1a, Drawing 3, Sheet 8)	Temporary diversion upstream of project to near Oak Ave. and construction of flood control channel	1.9		No	404: Restored on site Sect. 7: NA
2. *Twelve Mile Creek* (Site 1-2, Drawing 7, Sheet 25)	Cut-and-cover portion of subway box	0.02		No	404: Restored on site Sect. 7: NA
3. *South Spruce Avenue Drainage Ditch Diversion* (Site 2-1a, Drawing 8, Sheet 30)	Cut-and-cover portion of alignment	0.05		No	404: Restored on site Sect. 7: NA
4. *South Spruce Avenue Seasonal Wetland* (Site 2-1b, Drawing 8, Sheet 30)	Cut-and-cover portion of subway box	0.25		No	404: Restored on site Sect. 7: NA
5. *Drainage Swale North of San Bruno CalTrain Station* (Site 2-2, Drawing 9, Sheet 35)	Cut-and-cover portion of alignment	0.01		No	404: Restored on site Sect. 7: NA
6. *West End of Cupid Row Canal* (Site 2-3a, Drawing 10, and Sheet 40)	Rerouted to the north to accomodate north portal from subway	0.06		Yes	404: New channel on s and Sect. 7: 2:1 on site or 3:1 off site
7. *North Tributary Channel to Cupid Row Canal* (Site 2-3b, Drawing 10, and Sheet 41)	Subway construction	0.05		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site

Table3.13-4 (continued)
Estimated Area of Wetlands
Temporarily Impacted by Construction Activities

Impacted Site[1]	Construction Activity	Area of Temporary Impact (Acres) Short-Term Impacts[2]	Long-Term Impacts[3]	Habitat for San Francisco Garter Snake[4]	Proposed Mitigation Ratio[5]
8. *Two Shallow Seasonal Wetlands* (Site 2-3d, Drawing 11, and Sheet 43A)	Construction laydown area		0.04	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
9. *Access Road* Northwest of Cupid Row Canal and Highway 101 (Site 2-3c, Drawing 11, and Sheet 43A)	Access road to construction laydown area		0.09	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
10. *San Felipe Canal, North* (Site 2-6a, Drawing 14, and Sheet 65)[6]	Footings for northern aerial wye stub	0.013		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site
11. *Madrone Street Ditch* (Site 2-10d, Drawing 19, Sheet 48)	Rerouted to the east for at-grade tracks	0.03		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site
12. *San Felipe Canal, Southern End* (Site 2-9, Drawing 17, Sheet 55)	Footing for southern aerial wye stub column	0.03		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site
13. *Mainline Construction Zone* Along San Felipe Canal and tributary channel to South Lomita Canal	10-foot-wide construction zone along mainline tracks		0.1	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
14. *Seasonal Wetland next to Highway 101* Northern Portion of Wetland (Site 2-8, Drawing 16, and Sheet 61)[6]	Isolation beneath northern leg of the aerial wye stub		0.16	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site

Table 3.13-4
Estimated Area of Wetlands
Temporarily Impacted by Construction Activities

Impacted Site[1]	Construction Activity	Area of Temporary Impact (Acres): Short-Term Impacts[2]	Area of Temporary Impact (Acres): Long-Term Impacts[3]	Habitat for San Francisco Garter Snake[4]	Proposed Mitigation Ratio[5]
1. *Colma Creek Diversion* (Site 1-1a, Drawing 3, Sheet 8)	Temporary diversion upstream of project to near Oak Ave. and construction of flood control channel	1.9		No	404: Restored on site Sect. 7: NA
2. *Twelve Mile Creek* (Site 1-2, Drawing 7, Sheet 25)	Cut-and-cover portion of subway box	0.02		No	404: Restored on site Sect. 7: NA
3. *South Spruce Avenue Drainage Ditch Diversion* (Site 2-1a, Drawing 8, Sheet 30)	Cut-and-cover portion of alignment	0.05		No	404: Restored on site Sect. 7: NA
4. *South Spruce Avenue Seasonal Wetland* (Site 2-1b, Drawing 8, Sheet 30)	Cut-and-cover portion of subway box	0.25		No	404: Restored on site Sect. 7: NA
5. *Drainage Swale North of San Bruno CalTrain Station* (Site 2-2, Drawing 9, Sheet 35)	Cut-and-cover portion of alignment	0.01		No	404: Restored on site Sect. 7: NA
6. *West End of Cupid Row Canal* (Site 2-3a, Drawing 10, and Sheet 40)	Rerouted to the north to accomodate north portal from subway	0.06		Yes	404: New channel on site and Sect. 7: 2:1 on site or 3:1 off site
7. *North Tributary Channel to Cupid Row Canal* (Site 2-3b, Drawing 10, and Sheet 41)	Subway construction	0.05		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site

Table3.13-4 (continued)
Estimated Area of Wetlands
Temporarily Impacted by Construction Activities

Impacted Site[1]	Construction Activity	Area of Temporary Impact (Acres) Short-Term Impacts[2]	Long-Term Impacts[3]	Habitat for San Francisco Garter Snake[4]	Proposed Mitigation Ratio[5]
8. *Two Shallow Seasonal Wetlands* (Site 2-3d, Drawing 11, and Sheet 43A)	Construction laydown area		0.04	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
9. *Access Road* Northwest of Cupid Row Canal and Highway 101 (Site 2-3c, Drawing 11, and Sheet 43A)	Access road to construction laydown area		0.09	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
10. *San Felipe Canal, North* (Site 2-6a, Drawing 14, and Sheet 65)[6]	Footings for northern aerial wye stub	0.013		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site
11. *Madrone Street Ditch* (Site 2-10d, Drawing 19, Sheet 48)	Rerouted to the east for at-grade tracks	0.03		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site
12. *San Felipe Canal, Southern End* (Site 2-9, Drawing 17, Sheet 55)	Footing for southern aerial wye stub column	0.03		Yes	404: Restored on site and Sect. 7: 2:1 on site or 3:1 off site
13. *Mainline Construction Zone* Along San Felipe Canal and tributary channel to South Lomita Canal	10-foot-wide construction zone along mainline tracks		0.1	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
14. *Seasonal Wetland next to Highway 101* Northern Portion of Wetland (Site 2-8, Drawing 16, and Sheet 61)[6]	Isolation beneath northern leg of the aerial wye stub		0.16	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site

Table3.13-4 (continued)
Estimated Area of Wetlands
Temporarily Impacted by Construction Activities

Impacted Site[1]	Construction Activity	Area of Temporary Impact (Acres) Short-Term Impacts[2]	Long-Term Impacts[3]	Habitat for San Francisco Garter Snake[4]	Proposed Mitigation Ratio[5]
15. *Seasonal Wetland next to Highway 101* Southern Portion of Wetland (Site 2-8, Drawing 16, Sheet 61)[6]	Aerial wye stub legs; Temporary pilings for construction trestle; Excavation for aerial wye footings		0.86	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
16. *Shallow Depression Wetland* (Site 2-6b, Drawing 14, and Sheet 65)	Construction of footing for aerial wye support column		0.02	Yes	404: Restored on site and Sect. 7: 3:1 on site or 5:1 off site
Total Area of Short-Term Temporary Impacts:		2.413			
Total Area of Long-Term Temporary Impacts:			1.27		
Total Area of Non-SFGS Wetland Habitats Impacted by Construction:		2.23			
Total Area of SFGS Wetland Habitats Impacted by Construction:		1.453			
Total Area of Wetlands Impacted by Construction:		3.683			

1 Impact sites are identified by the site identification number and drawing in Appendix A of the Section 404 Mitigation and Restoration Proposal and the sheet number in the 404 application.

2 Short-term construction impacts are defined as those lasting six months or less.

3 Long-term construction impacts are defined as those lasting longer than 6 months in wetlands that are habitat for the San Francisco Garter Snake.

4 SFGS habitat includes habitat for the red-legged frog and the San Francisco forktail damselfly. The habitat area is on and in the vicinity of the west of Bayshore parcel.

5 Impacts to wetlands which are SFGS habitat will be restored under both Section 404 of the Clean Water Act *and* mitigated under Section 7 of the Endangered Species Act.

6 Impact reduced due to project design changes since the 404 permit application was submitted.

indirect impact, combined with the direct impacts from constructing the trestle, makes this mitigative feature a long-term temporary impact to the upland and wetland habitats it covers. The area of direct impacts from construction of the trestle would be approximately 0.27 acres of upland habitat. The area of the indirect impacts, when defined as that area directly beneath the trestle, would be approximately 1.7 acres of upland habitat. Impacts of the trestle to wetlands are discussed below under direct impacts.

Direct Impacts. Examples of direct impacts to sensitive species habitats include the loss or disturbance of feeding habitats, the temporary loss of cover habitats (or hibernacula), increased potential for mortality due to predation, and mortality of individuals within construction sites or that move onto construction sites where they could be crushed by heavy equipment. The need to trap and handle SFGS to clear construction sites may affect the survivability of those individuals trapped. These direct construction-related impacts would occur in both upland and wetland habitats used by the SFGS and red-legged frog. As with the indirect impacts described above, there are short-term (six months or less) and long-term temporary (greater than six months and through one reproductive cycle of the SFGS) construction impacts. Construction-related impacts to sensitive species habitats are listed in Table 3.13-4.

- **SFGS Wetland Habitats**. While all of the construction sites on the west of Bayshore parcel are sensitive, certain wetland areas are of particular concern in regards to potential impacts to the SFGS and California red-legged frog. These areas include Cupid Row Canal and areas in the immediate vicinity of this canal, those portions of the mainline track that run next to South Lomita Canal and San Felipe Canal, and some of the seasonal wetlands scattered throughout the west of Bayshore parcel. The specific wetland habitat sites that would be temporarily disturbed due to construction-related activities are listed in Table 3.13-4 and described in Impacts 2 and 5 above.

  Since the large seasonal wetland next to Highway 101 would be disturbed by several construction activities throughout the entire construction period, the entire southern portion of this wetland is considered an area of long-term temporary (or permanent) impacts to sensitive species habitat. This area includes approximately 0.86 acres between the northern side of the temporary construction trestle and the southern end of the wetland. Long-term activities including installation of PG&E towers and the northern aerial wye-stub, could effectively make this entire area unsuitable for the SFGS or the red-legged frog. Other wetlands which would be impacted directly by long-term construction activities include a small seasonal wetland (approximately 0.02 acres) near the third footing for the northern aerial wye-stub that would be beneath the construction trestle, and approximately 0.1 acres of wetlands in the 10-foot-wide construction zone east of the proposed retention wall.

  Based upon the descriptions noted above and in Impacts 2 and 5, construction of the proposed project would temporarily disturb approximately 1.453 acres of SFGS wetland habitat on and in the immediate vicinity of the west of Bayshore parcel. Approximately 0.183 acres of these temporary-construction related impacts to wetlands would be short term and 1.27 acres would be long term.

- **SFGS Upland Habitats.** For the purposes of this impact evaluation, all upland habitats within the west of Bayshore parcel have been considered potential upland habitat for the SFGS. Prior to project construction, BART would conduct a field survey to further define

and delineate the potential winter cover (hibernacula) for the SFGS in relation to proposed project impact sites. As indicated in Table 3.13-5, construction of the proposed project would temporarily disturb a total of between approximately 6.93 and 8.38 acres of SFGS upland habitat to construct the aerial footings, the area within the Alternative C construction laydown and storage site, access routes to and from the construction laydown area and PG&E work sites, and the 10-foot-wide construction zone east of the proposed mainline alignment. Of the total acres of upland habitat that would be temporarily disturbed, approximately 1.15 acres would have short-term impacts and between 5.78 and 7.23 acres would have long-term impacts.

MITIGATION MEASURES. Suitable mitigation measures for this impact have been developed and approved in consultation with the USFWS, under Section 7 of the FESA, and with the CDFG, under the state ESA. The following mitigation measures, described in greater detail in the Biological Assessment and Biological Opinion, in Volume V of this FEIR/FEIS would reduce impacts to the SFGS and the California red-legged frog to an insignificant level. Mitigation Measure 1.1 (Exclusion Fencing of Construction Areas) would also reduce these impacts.

9.1 *Management and Enhancement of Existing Aquatic Habitats.* Various management practices will be implemented by BART and other agencies, such as the SFIA, to improve the habitat quality for the SFGS and California red-legged frog on the west of Bayshore parcel. These habitat enhancement practices are discussed in Mitigation Measure 3.1, in Section 3.7, Biological Resources, of this chapter, and in the Biological Assessment and Biological Opinion in Volume V of this FEIR/FEIS.

9.2 *Replacement of SFGS Wetland/Upland Habitat.* Habitat replacement includes enhancement of upland habitat and creation of wetland habitat adjacent to the west of Bayshore habitat (referred to as "on-site") which would directly support the on-site population of SFGS and California red-legged frogs. This wetland would be developed from an approximate 5- to 6-acre strip of land extending south from the existing San Bruno Caltrain Station to just north of Center Street. It is bordered to the east by the right-of-way for the Caltrain system and to the west by Huntington/San Antonio Avenues. The property is approximately 90 feet from the west of Bayshore habitat. The USFWS replacement ratio for creation at this on-site location is three acres of upland for each acre of wetland. Using this ratio, BART could create a maximum of approximately 1.5 acres of wetland in an area adjacent to the west of Bayshore parcel in the vicinity of Santa Helena and San Antonio Avenues in the City of Millbrae. Upland areas would be interspersed in the wetland development. BART will provide water of sufficient quantity (minimum 3.5 feet, maximum 5 feet in depth) and quality to support the California red-legged frog. Fencing and/or other appropriate barriers would surround the mitigation area to prevent SFGS access to adjacent residential areas. SFGS access to the larger habitat on the west of Bayshore parcel would be provided through existing drainage culverts. In addition, 4 dry culverts, 18-24 inches in diameter will be placed under the existing Caltrain tracks and proposed BART tracks to provide free movement of SFGS to and from the west of Bayshore parcel.

9.3 *Compensation for SFGS Wetland/Upland Habitat.* Habitat compensation is defined as securing and preserving existing SFGS wetland/upland habitat away from the west of Bayshore habitat (referred to as "off-site.") BART will secure existing SFGS habitat at a 5:1 ratio (compensation: impact) for permanently impacted wetlands and 3:1 for temporary

impacted wetlands. BART will also provide an endowment for the future maintenance of this habitat in perpetuity for a 244-acre parcel of land in the southwestern corner of San Mateo County (Steel Ranch). The property purchased or deeded for compensation would include upland and wetland habitat and would exist as a protected habitat. BART will identify an agency or other entity to maintain the property, using the interest from the endowment. BART will provide an endowment of sufficient amount to provide for an approximate $50,000 annual fund for maintenance and management.

If for any reason Steel Ranch can not be purchased BART will acquire an alternate parcel to be approved by the USFWS. If, for any unforeseen reason, it becomes impossible for BART to secure any preserve for suitable "off-site" location, BART will stop all work that might adversely affect the SFGS and California red-legged frog habitat, and consult with the USFWS and CDFG to develop a new mitigation proposal. BART will not restart work that affects the protected species until the USFWS and CDFG have accepted the new mitigation and its implementation is assured.

9.4 *Biological Monitoring During Construction.* A biological monitor would be onsite during project construction to assure that the mitigation measures defined above are in place and effective and remove all SFGS and red-legged frogs found in construction activities are allowed to proceed. A biological monitor(s) will help minimize the direct loss or harming of SFGS and, red-legged frogs and accidental disturbances to habitats. A qualified biologist will be needed at the site to address unexpected issues and minimize construction delays.

A biological monitor will be present to check the construction sites daily for SFGS, when the snakes are the most active (March to May) and periodically during the remainder of the year. The biologist will educate construction crews on the sensitivity and identification of the SFGS and impose penalties for taking or handling the snake. Members of the construction crews will be given "flash cards" with pictures of the SFGS and California red-legged frog and a brief description of each species. In addition, poster-sized pictures and descriptions of these species will be displayed at prominent locations in the contractors' laydown area. In the event an SFGS is found in the construction area, the monitoring biologist will be notified immediately and all construction activity in that area will immediately cease. The monitoring biologist will immediately notify the USFWS and CDFG, and removal will occur as approved by these agencies.

A Biological Monitoring Plan will be developed and approved by the USFWS, CDFG, BART, and the construction contractor(s). Additional elements of this plan include the identification of persons and responsibilities as well as reporting procedures and schedules, definitions of acceptable operating procedures, emergency response program, and site restoration and soil erosion control measures and practices. Details of these elements can be found in the Biological Assessment and Biological Opinion in Volume V of this FEIR/FEIS.

Cumulative Analysis

In addition to the BART extension, other pending projects within the study area include the El Camino Corridor redevelopment project, the extension of Hickey Boulevard, and SFIA expansion plans.

Construction of the proposed project would result in the disturbance of native, non-native, and disturbed habitats in the project area. Although not considered significant, construction activities in the El Camino Corridor redevelopment project area would add to the loss of creekside habitat along Colma Creek, as noted in that project's DEIR (South San Francisco Redevelopment Agency, 1993).

Significant cumulative, short-term effects on biological resources due to the construction of the project in combination with future SFIA expansion include the loss and/or degradation of wetlands as well as foraging and breeding habitats for the SFGS, California red-legged frog, and San Francisco forktail damselfly. Consequently, the construction of the project would contribute to significant cumulative impacts to the endangered SFGS, due to a reduction of foraging and breeding habitats immediately adjacent to and on the SFIA property west of Highway 101.

Potential cumulative impacts to the San Francisco forktail damselfly include the overall reduction of foraging and breeding habitat. Six of the 22 recorded known habitat areas of the species no longer occur, and the remaining 16 localities are threatened by human activities (Hafernik, 1992). Therefore, all cumulative impacts to its habitat are considered significant.

Factors contributing to the continuing decline of the California red-legged frog are poorly understood. Though its known distribution is rather extensive west of the Sierra-Cascade crest and in the coast ranges throughout the entire state, it has apparently been extirpated from the Central Valley and from over 50 percent of the foothill drainages where it has been historically recorded (Hayes and Jennings, 1988). Its preferred habitat, slow-moving streams and channels, is among the most limited in the state. In addition, it appears to be highly susceptible to aggressive, non-native predator species, such as the bullfrog and various non-native fish (Moyle, 1973). Consequently, the proposed project and the SFIA Master Plan would contribute to significant cumulative impacts to this frog.

Significant cumulative impacts to biological resources would be reduced to an insignificant level through implementation of the project-specific mitigation measures described in this section.

Hydrology and Water Quality

Significance Criteria

The Aerial Design Option LPA would have significant project-specific or cumulative construction impacts if it resulted in degradation of water quality from stormwater runoff, dewatering operations, or erosion and sedimentation. Significant impacts would result if flooding was caused by stormwater blockage during construction.

Project-Specific Analysis

1. *Stormwater runoff during construction would carry away soil disturbed by earthwork operations. This activity may lower downstream water quality. (S)*

   Water quality downstream of earthwork operations may be degraded by sediment loads from disturbed soil or by pollutants leaching from contaminated soil. Various earthwork activities, such as below-grade excavations, fill placement, clearing, grubbing, and soil stockpiling, would occur along the entire project corridor. Stormwater runoff would erode soil loosened by earthwork

activities, transporting it downstream. This muddied water may be several orders of magnitude higher in eroded soil particles than would otherwise occur.

Minimum acceptable water quality standards for stormwater discharge are regulated by the NPDES construction permit that would be required for this project. Those regulations require that a SWPPP be implemented and enforced. The SWPPP requires erosion and sediment control, and prevention of contaminated water discharge These releases that are discharged to navigable waters are regulated by the Clean Water Act and subject to certification or waiver under Section 401 of this statute. The Regional Water Quality Control Board will issue a water quality certification as part of the 404 permit for the project.

The NPDES standard for erosion and sediment control states that, to the extent feasible, a net increase of sediment load in stormwater discharge should be prevented; the NPDES standard for contaminated stormwater discharge "prohibits the discharge of contaminated water in excess of reportable quantities established in 40 Code of Federal Regulations (CFR) 117.3 or 40 CFR 302.4, unless a separate NPDES permit is issued" (State Water Resources Control Board, 1992). For more information on contaminated soil impacts and standards, refer to Construction/Public Health and Safety later in this section.

Although driving and removing pilings would result in an increase in suspended soil in stormwater runoff, use of the construction trestle would minimize runoff. Soil may be suspended in the water covering the wetland area during the rainy season. Since the water would be slow-moving, much of the soil would settle out before the water discharged into the San Francisco Bay; therefore, no significant impact would occur.

MITIGATION MEASURES. The following recommendation would reduce earthwork impacts on water quality to an insignificant level.

1.1 *NPDES Construction Permit.* Specific mitigation measures to reduce the impact of stormwater discharge will be defined in the NPDES permit issued by the RWQCB for implementation by BART and its construction contractors. The standard methods of mitigating erosion and sedimentation described under NPDES best management practices include the use of detention basins, straw bale dikes, silt fences, earth dikes, brush barriers, velocity dissipation, inlet protection, rock outlet protection, sediment traps, temporary sediment basins, and other similar controls. At a minimum, sandbag dikes, silt fences, straw bale dikes, or equivalent control practices would be required for all construction sites where stormwater runoff could travel offsite to a natural drainageway or stormwater drain.

2. *Discharge from dewatering operations for the below-grade portions of the project alignment from the Colma Station tailtracks to the Millbrae Avenue Station may not meet acceptable water quality standards for introduction into drainageways. (S)*

MITIGATION MEASURES. Mitigation Measures 6.1 and 6.2 recommended in Construction/Biological Resources, i.e., sediment basins or tanks and slurry and/or sheet pile shoring walls, apply to this impact and would reduce the impact to an insignificant level. Mitigation measures for contaminated water are presented under Construction/Public Health and Safety of this section and would reduce the impact from disposal of contaminated groundwater to an insignificant level.

3. *Construction activities in drainageways and floodplains may temporarily block the flow of water and increase the risk of flooding. (S)*

Construction of the Aerial Design Option LPA would divert 500 feet of Colma Creek north of Chestnut Avenue, 200 feet of Twelve Mile Creek south of Chestnut Avenue, 600 feet of drainage channel along the easterly side of the SPTCo tracks northwest of the Cupid Row Canal crossing, and a portion of Cupid Row Canal at the point where the alignment crosses the canal.

In south Millbrae and north Burlingame, neither the east-west drainage canal south of Bayside Manor nor the El Portal Canal that turns east at the Millbrae/Burlingame city limits would be directly impacted by construction of the Millbrae Avenue Station, the BART turnback/tailtracks, or CalTrain shooflies, based on the preliminary engineering drawings.

The proposed temporary construction access road to Highway 101 would be elevated on pier footings approximately 3 feet above the ground surface. This raising of the access road would avoid impacting the adjacent flood-prone areas.

MITIGATION MEASURES. The following mitigation measures would reduce the impact of flooding to an insignificant level.

3.1 *Dry Season Construction.* The diversion or modification of drainageways that obstruct the channel will be done during periods of low rainfall, approximately between April 15 and October 15, so that drainageways will be operational during the wet season.

3.2 *Maintain Unobstructed Drainageways.* Drainageway diversions necessary to accommodate construction activities during the wet period will be made fully operational before existing drainageways are blocked off.

4. *Construction of the Aerial Design Option LPA could contaminate the Colma/Merced aquifers. (S)*

Perched water is known to occur along the project corridor. Perched water is groundwater that is trapped, typically above a clay lens of soil. Penetrating this impervious layer of soil during project construction would provide an avenue for perched water to seep into the underlying groundwater system. The perched water is of unknown quality, and the potential exists that it may be contaminated. The underlying aquifer may become contaminated by mingling with polluted perched water.

This potential for contamination exists for below-grade portions of the proposed project that penetrate the clay lens of perched water, specifically between the Colma tailtracks and South Spruce Avenue and between the proposed Tanforan Station and San Felipe Avenue. If the excavation were to puncture the impermeable clay lens, perched water may seep along the wall of the below-grade structure and through the backfill of the excavation.

MITIGATION MEASURES. Implementation of the following mitigation measure would reduce the potential contamination impact to an insignificant level.

4.1 *Prevention of Aquifer Contamination.* To prevent contamination of aquifers, BART will conduct a hazardous materials investigation of the alignment prior to construction. If contamination is found, it will be either remediated to a level acceptable to the appropriate regulatory agency or the project will be designed to prevent the spread of contamination by using slurry walls to isolate contamination.

5. *Chemical spills and leaking of construction machinery could contaminate groundwater or stormwater runoff. (S)*

MITIGATION MEASURES. Mitigation measures beyond those required by the NPDES construction permit are unnecessary. The NPDES permit, recommended by Mitigation Measure 1.1 above, would mitigate stormwater contamination impacts to an insignificant level.

Cumulative Analysis

In addition to the BART extension, other current pending projects within the project corridor include the SFIA expansion, an increase in CalTrain service, the Hickey Boulevard extension to Highway 101, and the El Camino Corridor redevelopment project.

These pending projects, in combination with the proposed project, have the potential of triggering cumulative erosion impacts. In particular, the El Camino Corridor redevelopment project would involve extensive earthwork in the vicinity of the proposed Hickey Station. These soil disturbances, in addition to those anticipated under the BART extension, may degrade downstream water quality along Colma Creek. All pending projects would be required by regulatory agencies to implement erosion control plans. Therefore, the decrease in water quality would not be significant.

Noise and Vibration

There are many noise- and/or vibration-sensitive areas adjacent to the Aerial Design Option LPA alignment, including residences, schools, a hospital, parks, and cemeteries. The degree to which noise and vibration from the BART extension construction would adversely affect local communities depends on the sensitivity of the surrounding land uses, the proximity of construction to these sensitive land uses, the specific pieces of equipment used for construction, the amount of existing noise control on the equipment, and the time of day and duration of noise- and/or vibration-inducing activities.

Large, heavy construction equipment and vehicles would be used for excavation of the cut-and-cover subway or retained cut portions of the project. The highest noise levels would occur during use of this equipment (e.g., dozers, scrapers, power shovels, cranes, backhoes). Hauling excavation spoils for extended periods, along city streets with noise sensitive receptors, could cause significant noise impacts. Construction of the subway or retained cut structure would require use of somewhat smaller equipment (e.g., cement trucks, pumps).

Generally, construction of the elevated portions of the extension would not cause as much impact because less time would be required in any one area to construct and erect the aerial structure. The at-grade portions of the extension would typically cause the least construction noise impact because of the shorter duration and use of smaller excavation equipment. Siting contractor's laydown areas close to noise-sensitive receptors (e.g., residences, schools) can lead to noise impacts.

Significance Criteria and Methodology

Significance Criteria. Construction noise impacts are addressed in terms of outdoor (exterior) noise levels. Indoor noise levels are less than exterior levels because buildings provide noise insulation. BART has adopted construction noise control criteria (BART System Design Criteria, 1992) which are

generally consistent with, but in some circumstances even more restrictive than, those recommended by the State of California Office of Noise Control in their *Model Noise Control Ordinance*.

The BART construction noise standards, which primarily apply to noise-sensitive buildings, are specified in terms of the temporal nature of the noise i.e., "continuous" or "intermittent", the time of day (daytime levels can be higher than nighttime levels), and the sensitivity of the affected receptor. For example, the BART standard for intermittent noise during the daytime (7 A.M. to 7 P.M.) is 75 dBA for single family residential areas in quiet neighborhoods. The corresponding nighttime noise criterion is 60 dBA, which essentially precludes all but minor nighttime construction activity in residential neighborhoods unless extensive noise control measures have been implemented. Specific noise standards for individual pieces of equipment are also specified in the BART criteria.

The BART construction noise criteria for sensitive receptors are indicated in Table 3.13-5 (for stationary equipment operating continuously) and Table 3.13-6 (for non-stationary equipment or intermittent use of equipment). The BART construction noise limits for individual pieces of equipment are indicated in Table 3.13-7. The BART construction criteria allow for designation of "special zones" (e.g., hospitals, schools) where noise and/or time restrictions apply.

Specific construction noise limits have been adopted by South San Francisco[1] and San Bruno[2] in their respective noise ordinances. Burlingame has no noise limits but places time restrictions (7 A.M. to 7 P.M.) on construction and demolition activity; this noise control ordinance provides for a six-month exemption. Colma and Millbrae have no noise ordinances and deal with noise on a nuisance basis.

South San Francisco allows daytime (8 A.M. to 8 P.M.) construction noise levels of 90 dBA at 25 feet. San Bruno allows daytime (7 A.M. and 10 P.M.) construction noise levels of 85 dBA at 100 feet. For residences located 50 feet from construction activity, the corresponding noise limits are 84 dBA and 91 dBA in South San Francisco and San Bruno, respectively. These daytime construction noise limits are higher than the BART daytime criteria for residences i.e., 75 dBA for intermittent noise in single family residential areas and 80 dBA in semi-residential/commercial areas), but are consistent with construction noise standards in San Francisco, Atherton, and Los Gatos, where 85 dBA is allowed in residential areas.

BART's nighttime construction noise criteria are generally consistent with the San Bruno nighttime noise limit of 60 dBA. The San Bruno nighttime noise limit is more restrictive when residences are closer than 100 feet, although the San Bruno noise ordinance provides exemptions, by permit, from the Director of

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1 Construction. Construction, alteration, repair or landscaping maintenance activities which are authorized by a valid city permit shall be allowed on weekdays between the hours of 8:00 a.m. and 8:00 p.m., on Saturdays between the hours of 9:00 a.m. and 8:00 p.m., and on Sundays and holidays between the hours of 10:00 a.m. and 6:00 p.m. or at such hours as may be authorized by the permit, if they meet at least one of the following noise limitations:

(1) No individual piece of equipment shall produce a noise level exceeding 90 dB at a distance of 25 feet. If the device is housed within a structure or trailer on the property, the measurements shall be made outside the structure at a distance as close as 25 feet from the equipment as possible.

(2) The noise level at any point outside of the property plane of the project shall not exceed 90 dB.

Source: South San Francisco Municipal Code

2 Construction of buildings and projects. No person shall, within any residential zone, or within a radius of five hundred feet therefrom, operate equipment or perform any outside construction or repairwork on any building, structure, or other project, or operate any pile driver, power shovel, pneumatic hammer, derrick, power hoist, or any other construction type device which shall exceed between the hours of 7:00 a.m. and 10:00 p.m. a noise level of eighty-five decibels as measured at one hundred feet, unless such person shall have first obtained a permit from the director of public works. No permit shall be required to perform emergency work. (Ord. 1354 § 1 (part), 1980; prior code § 16-4.7)

Source: San Bruno Municipal Code

Table 3.13-5
Limits for Continuous Construction Noise*

Affected Structure or Area	Maximum Allowable Continuous Noise Level, dBA	
Residential	Daytime	Nighttime
Single family residence	60	50
along an arterial or in multi-family residential areas, including hospitals	65	55
in semi-residential/commercial areas, including hotels	70	60
Commercial	At All Times	
in semi-residential/commercial areas, including schools	65	
in commercial areas with no nighttime residency	70	
Industrial		
all locations	80	

Source: BART Extensions Program System Design Criteria, March 1992.

* Prevent noises from stationary sources, parked mobile sources or any source or combination of sources producing repetitive or long-term noise, lasting more than a few hours, from exceeding the limits indicated. Noise limits apply at 200 feet from the construction limits or at nearest affected building, whichever is closer.

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Table 3.13-6
Limits for Intermittent Construction Noise*

Affected Structure or Area	Maximum Allowable Intermittent Noise Level, dBA	
Residential	Daytime	Nighttime
Single family residence	75	60
along an arterial or in multi-family residential areas, including hospitals	75	65
in semi-residential/commercial areas, including hotels	80	70
Commercial	At All Times	
in semi residential/commercial areas, including schools	80	
in commercial areas with no nighttime residency	85	
Industrial		
all locations	90	

Source: BART Extensions Program System Design Criteria, March 1992.

* Prevent noises from non-stationary mobile equipment operated by a driver or from any source of non-scheduled intermittent, non-repetitive, short-term noises, not lasting more than a few hours, from exceeding the limits indicated. Noise limits apply at 200 feet from the construction limits or at the nearest affected building, whichever is closer.

Table 3.13-7
BART Noise Emission Limits on Construction Noise

Type of Equipment	Maximum Noise Limit* Date Equipment Acquired	
	Before January 1, 1986	On or After January 1, 1986
All equipment other than highway trucks, including hand tools and heavy equipment	90 dBA	85 dBA
Highway trucks in any operating mode or location	83 dBA	80 dBA

Source: BART Extensions Program System Design Criteria, March 1992.

Notes: Peak levels due to impact pile drivers may exceed the above noise emission limits by 10 dBA.

* Measured at 50 feet.

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Table 3.13-8
Limits for Construction Vibration*

Vibration Type and Possible Aggregate Duration	Limit
Sustained (≥1 hr/day))	0.01 in/sec (80dB rc 10^{-6} in/sec)
Transient (<1 hr/day)	0.03 in/sec (90dB rc 10^{-6} in/sec)
Transient (<10 min/day)	0.10 in/sec (100dB rc 10^{-6} in/sec)

Source: BART Extensions Program System Design Criteria, March 1992.

* Construction activities shall be conducted so that vibration levels at a distance of 200 feet from the construction limits or at the nearest affected building (whichever is closer) so as not to exceed the indicated root-mean-square vibration velocity levels in any direction over the frequency range of 1 to 100 Hertz.

Public Works. The BART criteria as well as the San Bruno nighttime noise limit essentially preclude all but minor nighttime construction (between 10 P.M. and 7 A.M.), unless extensive noise control is implemented.

None of the communities in the project corridor have ordinances or codes that place limits on vibration. The BART System Design Criteria provide construction vibration criteria for vibration-sensitive receptors, which include residences, schools, and hospitals. These criteria minimize significant annoyance and are low enough to avoid damage to buildings similar to those in the project corridor.

Table 3.13-8 indicates the BART construction vibration criteria. These criteria are conservative and are intended to provide general guidelines; they may not be applicable in all situations. Actual distances necessary to limit pile-driving vibration levels to those indicated in Table 3.13-8 will depend on local soil conditions, the amount of pre-drilling, and the specific pile driver used. Due to the short-term, temporary aspect of construction noise, there are no cumulative noise criteria for construction. The following noise and vibration standards and policies are part of the BART design criteria.

1. *Construction Noise and Vibration Criteria.* Criteria for construction noise and vibration and measurement of construction noise and vibration, as contained in BART's System Design Criteria, will be included in construction contract documents as they are developed in the engineering phase of the project. Where there are local agency noise criteria that are more restrictive, these criteria will be adopted by BART and applied to the entire project as the "project construction noise and vibration criteria."

2. *Contractor's Noise Control Plan.* The construction contractor(s) will be required, as part of the mitigation monitoring program for the project, to develop a construction noise control program plan for their work and any subcontractor's work. The construction noise control plan will incorporate noise control measures necessary to achieve the project construction noise and vibration criteria.

3. *Environmental Compliance Monitoring.* A qualified, independent environmental consultant, under the direction of the resident engineer, will be retained by the construction management team to monitor noise and vibration levels to assure compliance with the project construction noise and vibration criteria. Enforcement of these noise and vibration criteria will be the responsibility of the resident engineer.

The following noise and vibration control measures are good construction practices and include, but are not limited to, the measures that the contractor will employ to achieve the project construction noise and vibration criteria:

1. Schedule construction activity and spoil removal operations that produce higher noise levels during less noise-sensitive hours.

2. Erect temporary noise barriers (e.g., walls, curtains) where noise criteria cannot be met using available construction equipment. Such walls can be metal or wood and may need to be in excess of 12 feet where receptors are close. Noise curtains or sound batting can be used as alternatives where wall heights are deemed to be excessive.

3. Avoid riveting and use welding instead, where appropriate and feasible.

4. Mix concrete offsite instead of onsite.

5. Use construction equipment, where feasible, that is not as noisy or is modified to lessen noise, such as:
   - Electric powered equipment instead of diesel equipment,
   - Hydraulic tools instead of pneumatic tools,
   - Effective intake and exhaust mufflers on internal-combustion engines and compressors, and
   - Hoppers, storage bins, and chutes lined or covered with sound-deadening material.

6. Maximize the physical separation between noise generators and noise receptors. Such separation includes, but is not limited to, the following measures:
   - Provide enclosures for stationary items of equipment and barriers around particularly noisy areas on the site or around the entire site,
   - Use shields, impervious fences, or other physical sound barriers to inhibit transmission of noise, and
   - Locate stationary equipment to minimize noise impacts on the community.
7. Minimize noise-intrusive impacts during the most noise-sensitive hours by:
   - Planning noisier operations during times of highest ambient noise levels:
   - Keeping noise levels relatively uniform, and
   - Avoiding peaks and impulsive noises.
8. Select haul routes for removal of excavation spoils in conjunction with local officials such that noise-sensitive areas, including residences, schools, and hospitals, are avoided as much as possible.

Numbers 1, 4, 5, 6, and 8 of the above-listed noise control measures are equally adaptable to vibration control. Specific mitigation measures for reducing ground vibration during construction are discussed where potentially significant vibration activities are identified (e.g., pile driving).

Methodology. The BART construction noise and vibration criteria (BART Systems Design Criteria, 1992) as modified by local noise standards (discussed above as the project construction noise and vibration criteria), will be included in construction documents as they are developed in the engineering phase of the project. Adherence to these noise and vibration standards will be enforced by the resident engineer and the construction management team and audited by an environmental compliance consultant. Adherence to the project construction noise and vibration criteria will ensure that no significant impacts occur to local residents.

Although no significant project construction noise and vibration impacts are indicated, except for those associated with pile driving, the potential need for temporary sound barriers during construction has been evaluated. This analysis is based on construction data contained in the *Draft SFO Airport Extension Preliminary Construction Scenario Report*. The analysis is based on the types of equipment proposed for construction in a particular area, the typical noise levels produced by such equipment, and the proximity of noise-sensitive receptors in those areas.

Typical construction equipment produces noise levels ranging from 70 to 95 dBA at 50 feet. Impact pile drivers, if not shielded, cause very high noise levels (in excess of 100 dBA at 50 feet). "Vibratory" pile drivers produce somewhat lower, but still high, noise levels (90 to 95 dBA at 50 feet) if not shielded. The amount of noise control installed on construction equipment and the distance from a particular noise-sensitive receptor to the construction site will largely determine the level of noise at the receptor.

Impact and vibratory pile driving can also generate high levels of vibration. The project corridor is relatively narrow, with residences as close as 20 to 50 feet from the alignment. In general, if impact or vibratory pile drivers are used, it may be difficult or impossible to meet the BART construction vibration criteria at distances less than 100 feet from the alignment. The ability to meet these criteria will depend on soil type and the distance from construction activity. The BART construction design criteria allow use of equivalent cast-in-drilled-hole piles and a more detailed analysis of potential problem areas during the

preliminary engineering phase and prior to issuance of a Notice to Proceed to the design/build contractor. The most appropriate methods and criteria will be determined during the final design phase of the design/build contract. Cast-in-drilled-hole piles could be substituted for driven piles to reduce noise.

Typical construction activities produce noise that depends on the type of equipment and the effectiveness of noise control installed on the equipment (e.g., muffler). Many of the noise-sensitive receptors (primarily residences) along the Aerial Design Option LPA alignment would be in the range of 50 to 150 feet from the construction site, with some residences closer than 50 feet. Where residences or noise-sensitive uses are within 50 feet of construction, it may be necessary to install temporary noise barriers to achieve the project construction noise criteria. For residences or other noise-sensitive uses 50 to 150 feet from construction, a temporary noise barrier may be required, unless use of mufflers or other good construction practices are incorporated.

Project-Specific Analysis

Colma

1. *Construction of the subway would require use of heavy machines and equipment, generating noise that could affect burial services and affect visitors to the cemeteries during the day. (S)*

   The cemeteries are a unique land use and will be classified as "special zones," with appropriate noise level and construction time restrictions defined and included in construction contract documents. Cemetery areas that would be shielded by the bluff on the east side of the proposed alignment and farther away from the construction would be less affected than those on the west side of the construction, which would be more directly exposed to noise.

   MITIGATION MEASURES. The following mitigation measure would reduce impacts to cemetery visitors to a less than significant level.

   1.1 *Temporary Noise Barriers.* BART will ensure that its contractors construct temporary noise barriers to the appropriate height(s) (likely to be from 8 to 12 feet) to reduce noise impacts to or below BART's project construction noise criteria. Implementation of this mitigation measure would result in a temporary, significant visual impact. The noise barrier would affect the open space, greenbelt image.

2. *Construction of the subway structure would require bracing the earthen side walls before pouring the concrete forms. Typically, impact pile drivers are used to drive soldier piles and lagging is inserted to hold up the side walls. Significant noise and vibration impacts could occur at Meadowbrook mobile home park if unshielded pile drivers are used. (S)*

   MITIGATION MEASURES. Implementation of one of the following measures would reduce noise and vibration impacts to an insignificant level.

   2.1 *Pre-drilled Piles.* In many instances, holes can be pre-drilled, which reduces the force necessary to install piles and decreases the duration of noise and vibration exposure as well as the noise and vibration level.

   2.2 *Cast-in-Drilled-Hole Piles.* Cast-in-drilled-hole piles will be used where soils permit. These piles are constructed by drilling a hole to the desired depth and constructing the pile from cast-in-place, reinforced concrete.

2.3 *Soil-Mix Wall Technology.* Soil-mix wall technology will be used where it is cost effective. Soil-mix technology consists of using multiple-shaft augers to mix soils with cement grout to construct overlapping cement columns.

2.4 *Shielded Pile Drivers.* Shielded pile drivers with padding will be used only where it is possible to meet BART's noise and vibration criteria. Shielded pile drivers produce less noise than unshielded pile drivers.

2.5 *Vibratory Pile Drivers.* Vibratory pile drivers with shielding will be used only where it is possible to meet BART's noise and vibration criteria.

South San Francisco

3. *Construction of the subway would require heavy machinery and equipment that could affect the mobile homes in the Treasure Island Trailer Court because of the proximity of the construction area i.e., 20 feet from the closest structure. (S)*

MITIGATION MEASURES. Implementation of the following mitigation measure would be necessary to achieve the project construction noise criteria and thus reduce this impact to an insignificant level.

3.1 *Temporary Noise Barriers.* BART will construct temporary noise barriers, which may need to be greater than 12 feet in height, to reduce noise impacts to or below BART's project construction noise criteria. Implementation of this mitigation measure would result in a temporary, significant visual impact.

4. *Construction of the subway structure would require bracing the earthen side walls before pouring the concrete forms. Typically, impact pile drivers are used to drive soldier piles and lagging is inserted to hold up the side walls. Significant noise and vibration could occur at the mobile homes in the Treasure Island Trailer Court if unshielded pile drivers are used. (S)*

MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.3, 2.4, or 2.5 recommended above, i.e., use of pre-drilled piles, cast-in-drilled-hole piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers, would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures.

5. *Construction of the subway would require heavy machinery and equipment, generating noise that could affect the residences in the Sunshine Gardens neighborhood along the west side of Mission Road, new residences off El Camino Real, mobile homes in the Red Arrow Trailer Park, residences in the area between South Spruce and West Orange Avenues (Mayfair and Town of Baden neighborhoods), residences on Antoinette Lane (Orange Park neighborhood), and the Los Cerritos Elementary School, all of which would be close to the construction area (50 feet to 125 feet away). (S)*

MITIGATION MEASURES. Implementation of Mitigation Measure 1.1 above, i.e., construction of temporary noise barriers, would reduce this impact to or below BART's project construction criteria. It would also result in a temporary, significant visual impact in that the noise barrier may create a perception of encroachment.

6. *Construction of the subway structure would require bracing the earthen side walls before pouring the concrete forms. Typically, impact pile drivers are used to drive soldier piles and lagging is inserted to hold up the side walls. Significant noise and vibration could occur at the residences in the Sunshine Gardens neighborhood along the west side of Mission Road, new residences off El Camino Real, mobile homes in the Red Arrow Trailer Park, residences in the area between South Spruce and West Orange Avenues (Mayfair and Town of Baden neighborhoods), residences on Antoinette Lane (Orange Park neighborhood), and the Los Cerritos Elementary School if unshielded pile drivers are used. (S)*

   MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.3, 2.4, or 2.5 recommended above, i.e., use of pre-drilled piles, cast-in-drilled-hole piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers, would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures.

7. *Construction of the subway would require heavy machinery and equipment, generating noise that could affect Kaiser Hospital (140 feet away). (S)*

   MITIGATION MEASURES. Kaiser Hospital is a unique land use and will be classified as a "special zone," with appropriate noise level and construction time restrictions defined and included in construction contract documents. Mitigation Measure 1.1 above, i.e., construction of temporary noise barriers, would be required to reduce noise impacts to the level stipulated in the construction contract documents. It would also result in a temporary, significant visual impact. The noise barrier would not result in a visual impact since no significant streetscapes, or scenic resources would be obstructed and residences would be greater than 60 feet away.

8. *Construction of the subway structure would require bracing the earthen side walls before pouring the concrete forms. Typically, impact pile drivers are used to drive soldier piles and lagging is inserted to hold up the side walls. Significant noise and vibration could occur at Kaiser Hospital if unshielded pile drivers are used. (S)*

   MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.3, 2.4, or 2.5 recommended above, i.e., use of pre-drilled piles, cast-in-drilled-hole piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers, would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures.

9. *Construction of the subway structure would require bracing the earthen side walls before pouring the concrete forms. Typically, impact pile drivers are used to drive soldier piles and lagging is inserted to hold up the side walls. Significant noise and vibration could occur at South San Francisco High School if unshielded pile drivers are used. (S)*

   MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.3, 2.4, or 2.5 recommended above i.e., use of pre-drilled piles, cast-in-drilled-hole piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers) would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from

unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures.

San Bruno

10. *Noise from use of heavy equipment to construct of the cut-and-cover subway and Tanforan Station could significantly affect the residents in the Fifth Addition neighborhood because of the proximity of construction to residences, i.e., within 150 feet. (S)*

    Construction noise from use of heavy equipment near the Fifth Addition residential neighborhood could result in significant noise impacts.

    MITIGATION MEASURES. Implementation of Mitigation Measure 1.1 above, i.e., construction of temporary noise barriers, would reduce noise impacts to these sensitive areas. This mitigation measure would result in a temporary, significant visual impact. The noise barrier may create a perception of encroachment.

11. *Construction of the subway structure would require bracing the earthen side walls before pouring the concrete forms. Typically, impact pile drivers are used to drive soldier piles and lagging is inserted to hold up the side walls. Significant noise and vibration could occur at the Fifth Addition neighborhood in San Bruno if unshielded pile drivers are used. (S)*

    MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.3, 2.4, or 2.5 recommended above i.e., use of pre-drilled piles, cast-in-drilled-hole piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers) would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures.

12. *Truck traffic to and from any of the three laydown areas in the vicinity of Lion's Field Park would result in significant, short-term noise impacts for residents along 1st Avenue. (S)*

    The west end of Lion's Field Park and homes along 1st Avenue would be affected by truck traffic, if the access route using 1st and San Mateo Avenues were selected. A typical excavation day would involve approximately 160 truck trips (both directions combined). During construction, truck trips could reach 240 trips (both directions combined). These activities would be repeated on an approximate eight-week cycle, with a week or two between excavation and concrete pour. These noise impacts would occur for the duration of the excavation and construction phase of the project.

    MITIGATION MEASURES. Significant noise impacts along the 1st Avenue haul route would be mitigated to an insignificant level by implementing the following measure.

    12.1 *Temporary Road and Wall Construction.* Construction traffic will not be allowed to use 1st Avenue but will be accommodated on a temporary haul route to the west, between 1st Avenue and the CalTrain tracks. In addition, a temporary noise barrier will be erected on either side of the temporary haul route. The mitigation would require use of the current CalTrain right-of-way and temporary relocation of the San Bruno CalTrain Station and would result in a temporary visual impact. The noise barrier may create a perception of encroachment.

13. *The optional haul route to the San Bruno contractor laydown area, using a temporary road along the westerly side of Highway 101, would not result in significant noise impacts. (I)*

14. *If impact pile driving were found to be necessary for construction of the aerial wye-stub to the SFIA, significant noise and vibration impacts from unshielded pile drivers could occur to wildlife and sensitive receptors along San Antonio Avenue. (S)*

    MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.3, 2.4, or 2.5 recommended above, i.e., use of pre-drilled piles, cast-in-drilled-hole piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers, would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures.

Millbrae

15. *Construction of the subway structure would require bracing the earthen side walls before pouring the concrete forms. Typically, impact pile drivers are used to drive soldier piles and lagging is inserted to hold up the side walls. Significant noise and vibration could occur at residences in the Bayside Manor and Millbrae Manor neighborhoods if unshielded pile drivers are used. (S)*

    MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.3, 2.4, or 2.5 recommended above, i.e., use of pre-drilled piles, cast-in-drilled-hole piles, soil-mix wall technology, shielded pile drivers, or vibratory pile drivers, would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures or equivalent mitigation.

16. *If impact pile driving were found to be necessary for construction of the Millbrae Avenue Station, significant noise impacts from unshielded pile drivers could occur at residences in the Serra Convalescent facility. (S)*

    MITIGATION MEASURES. Implementation of either Mitigation Measure 2.1, 2.2, 2.4, or 2.5 recommended above, i.e., use of pre-drilled piles, cast-in-drilled-hole piles, shielded pile drivers, or vibratory pile drivers, would reduce noise and vibration impacts to an insignificant level. Where significant noise and vibration impacts would occur from unshielded pile driving, BART will meet its noise and vibration criteria with one of the above mitigation measures.

17. *Construction of the subway adjacent to the Bayside Manor, Millbrae Manor, Marino Vista, and North Millbrae neighborhoods would require the use of heavy equipment and machines that generate noise and could affect residences. (S)*

    The Millbrae Avenue Station site would be used as a laydown area; as a result, residences on Aviador Avenue could be affected by construction activities. There would also be noise impacts to residences on either side of the CalTrain right-of-way due to trucks. Residents adjacent to the right-of-way in the following neighborhoods would be exposed to significant noise levels: Bayside Manor, Millbrae Manor, North Millbrae, and Marino Vista.

    By contrast, the truck route for the Millbrae laydown area would run from Rollins Road to Millbrae Avenue to Highway 101. There are no known noise-sensitive receptors along Millbrae Avenue east

of the CalTrain tracks. Consequently, there would be no significant noise impacts associated with this truck route.

MITIGATION MEASURES. Implementation of Mitigation Measure 3.1 recommended above, i.e., construction of temporary noise barriers, would reduce the noise impact to an insignificant level. This measure would cause a temporary visual impact. The noise barrier may create a perception of encroachment.

Burlingame

18. *Construction of the tailtracks would not affect sensitive receptors because land uses in this area of Burlingame are primarily industrial. Construction would occur at grade, and no pile driving would be necessary. (I)*

Cumulative Analysis

The current background noise environment at the SFIA is normally loud due to aircraft operations; according the SFIA Master Plan, the community noise equivalent level is greater than 75 dBA. Noise from construction activity would be expected to increase noise levels in this environment, but, such increases would be unlikely to raise the ambient levels sufficiently to create a significant effect. Cumulative noise impacts at the SFIA could occur in two different ways. First, if construction of SFIA Master Plan Projects coincided with BART construction at the SFIA, noise-generating activities could cumulate, resulting in greater noise emissions than would have occurred with only one project under construction. Second, cumulative noise impacts could occur if the SFIA and BART construction schedules were concurrent, but one of the projects were delayed. Under this scenario, construction-period noise would occur over a longer time period and increase the duration over which receptors were exposed to high noise levels. As noted above, the first scenario would not result in significant cumulative levels, because of already high ambient levels. The second scenario is not expected, because the SFIA's construction schedule is projected to extend from 1996 through 2005 (covering both the SFIA's near-term and long-term projects), and BART construction would occur within this period. In other words, BART construction would have started and finished during the SFIA expansion program.

Air Quality

Significance Criteria and Methodology

Significance Criteria. The BAAQMD significance criteria for a project or plan are defined in *Air Quality and Urban Development – Guidelines for Assessing Impacts of Projects and Plans* (BAAQMD, 1985). Significance criteria for the BART extension have been adapted from the BAAQMD guidance to more closely reflect the current regulatory framework. Project-specific or cumulative construction-related air quality impacts will be considered significant:

- For non-photochemically reactive pollutants (CO and PM_{10}), if project-specific emissions cause ambient air concentrations which, when added to background, result in a violation of a state or federal ambient air quality standard.
- For nonattainment pollutants (O_3, CO, and PM_{10}), if the net increase in regional emissions due to the project exceeds the applicable BAAQMD threshold in effect at the time of project approval.

The threshold represents the level above which the BAAQMD requires the use of BACT and/or the provision of offsetting emission reductions in order to obtain a permit for a new or modified stationary source. While not specifically applicable to transportation projects, this level represents the most conservative (lowest) emission level that could be considered significant for nonattainment pollutants. For O_3, the numerical emission offset threshold is applied to precursors measured as NO_x and ROG.

- For attainment pollutants NO_2 and SO_2, if the net increase in emissions due to the project exceeds 150 lb/day.

Table 3.13-9 summarizes the numerical thresholds associated with the significance criteria described above.

Table 3.13-9
Significance Thresholds for Construction-Related Air Pollutant Emissions

Pollutant	BACT/Emission Offset Threshold (1)	Net Increase Threshold (2)
Ozone (O_3) (3)		
Oxides of Nitrogen (NO_x) (ozone precursor)	10 lb/highest day 15 ton/year	NA (4)
Reactive Organic Gases (ROG) (ozone precursor)	10 lb/highest day 15 ton/year	NA
Carbon Monoxide (CO)	10 lb/highest day	NA
Nitrogen Dioxide (NO_2)	NA	150 lb/day
Sulfur Dioxide (SO_2)	NA	150 lb/day
Particulate Matter (PM_{10})	10 lb/highest day 1 ton/year	NA

Notes:
1) The BACT/emission offset threshold is applicable to a net increase in emissions of nonattainment pollutants.
2) The net increase threshold is applicable to a net increase in emissions of attainment pollutants.
3) For O_3, the BACT/emission offset threshold is applied to precursors measured as NO_x and ROG.
4) "NA" means not applicable.

Methodology. Two sources of construction-related air pollutant emissions were evaluated: exhaust emissions from construction equipment and fugitive dust emissions. A complete discussion of the methodology and assumptions used to estimate construction-related emissions is presented in the Air Quality Technical Report. The methodology is summarized below.

Exhaust emissions of NO_x, ROG, CO, and PM_{10} were estimated using the equipment lists and construction schedules detailed in the Construction Scenario Report prepared by Bay Area Transit Consultants (BATC, 1993) and standard equipment emission factors obtained from the EPA and the South Coast Air Quality Management District. Fugitive PM_{10} emissions were estimated using an emission factor with units of pounds per acre of disturbed area per month (lb/acre/mo). Based on review of the Construction Scenario Report, it was assumed that the entire corridor would be disturbed continuously over a 25-month construction period. Although the construction scenario requires almost continuous activity in each corridor segment during the entire construction period, it is not likely that all activities would involve earth-moving, the major contributor to fugitive dust emissions. Therefore, this assumption is a conservative one.

Project-Specific Analysis

1. *Construction-related emissions of NO_x, ROG, CO, and PM_{10} would exceed their respective significance thresholds for nonattainment pollutants. Construction-related emissions of NO_2 would exceed the significance threshold for attainment pollutants. In addition, construction-related emissions of PM_{10} could cause temporary, localized exceedances of the state or federal ambient air quality standard. (S)*

   Air pollutant emissions associated with construction of the Aerial Design Option LPA are identified in Table 3.13-10. Construction-related emissions exceed the following significance thresholds: 1) emissions of O_3 precursors (NO_x and ROG) exceed the emission offset/BACT threshold of 10 lb/day or 15 ton/yr; 2) emissions of CO exceed the emission offset/BACT threshold of 10 lb/day; 3) emissions of NO_2 exceed the net increase threshold of 150 lb/day; and 4) emissions of PM_{10} exceed the emission offset/BACT threshold of 10 lb/day or 1 ton/yr.

   MITIGATION MEASURES. Implementation of the following mitigation measures would partially reduce equipment exhaust emissions and fugitive dust emissions associated with construction. Implementation of these measures, however, would not reduce emissions to levels below the significance thresholds. Therefore, construction emissions of NO_x, ROG, CO, NO_2, and PM_{10} would temporarily exceed the significance criteria.

   1.1 *Construction Parking.* BART will require construction contractors to configure parking to minimize traffic interference.

   1.2 *Temporary Traffic Control.* BART will require construction contractors to provide temporary traffic control during all phases of construction.

   1.3 *Construction Traffic Management.* BART will require construction contractors to develop a construction traffic management plan that reroutes construction traffic off congested streets, consolidates truck deliveries, and provides dedicated turn lanes, where feasible, for movement of construction vehicles and equipment on and off the site.

   1.4 *Equipment Engine Maintenance.* BART will include contractor specifications that require contractors to keep equipment engines maintained and in proper tune to minimize air emissions.

Table 3.13-10
Construction-Related Air Pollutant Emissions

	Equipment Exhaust					Fugitive	Total
	NO_x	ROG	CO	SO_x	PM_{10}	PM_{10}	PM_{10}
Emissions (lb/day)	1,000	99	410	87	76	2,000	2,000
Emissions (ton/yr)	180	18	74	16	14	300	300

Notes:

1) Exhaust emissions of nitrogen dioxide (NO_2) and sulfur dioxide (SO_2) were not explicitly calculated, but are assumed equal to the calculated exhaust emissions of NO_x and SO_x, respectively.

2) Emission estimates are based on equipment horsepower ratings, load factors, and pollutant emission factorsobtained from *CEQA Air Quality Handbook* (SCAQMD, 1993) and *Compilation of Air Pollutant Emission Factors AP-42 Volume II: Mobile Sources* (EPA, 1985); equipment usage data obtained from *Construction Scenario Report* (BATC, 1994) and *Construction Scenario Report for Alternative VI Aerial Wye-Stub Design Option* (BATC, 1995).

1.5 *Best Construction Practices.* BART will require construction contractors to use best construction practices and methods to minimize fugitive PM_{10} emissions, such as:

- Application of nontoxic soil stabilizers to all inactive construction areas (previously-graded areas inactive for 10 days or more) where regular watering is not effective for control of PM_{10}.
- Replacement of ground cover in disturbed areas as quickly as possible.
- Enclosure, cover, and twice-daily watering of all exposed piles which have 5 percent or greater silt content. Soil binders may be used as an alternative to watering.
- Watering of active sites at least twice a day.
- Cover of, and provision of 2 vertical feet of freeboard in, all trucks hauling dirt, sand, soil, or other loose material, in accordance with California Vehicle Code Section 23114.
- Sweeping of streets at the end of the day in cases where visible soil/dust material is carried onto adjacent public paved roads.
- Use of wash trucks or wheel washers where vehicles enter and exit unpaved areas onto paved roads.
- Control of traffic speeds in unpaved areas to 15 miles per hour or less.

Cumulative Analysis

Construction of the Aerial Design Option LPA would occur concurrently with expansion of the SFIA and possibly with El Camino Corridor redevelopment activities and the Hickey Boulevard extension in South

San Francisco. Construction-related air quality impacts will be considered significant if cumulative emissions of air pollutants exceed their respective significance thresholds. The air pollutant emissions associated with construction of concurrent projects were not quantitatively evaluated for this analysis; therefore, cumulative, construction-related impacts of the Aerial Design Option LPA are evaluated qualitatively.

As noted above, project-specific, construction-related emissions of NO_x, ROG, CO, NO_2, and PM_{10} under the Aerial Design Option LPA would exceed respective significance thresholds. Therefore, cumulative emissions of these pollutants would also exceed the thresholds during construction. In addition, cumulative emissions of SO_2 may exceed the significance threshold for SO_2. The same project-specific mitigation measures recommended above (Mitigation Measures 1.1 through 1.5) also apply to cumulative impacts and would partially reduce air pollutant emissions. However, cumulative construction-related emissions of NO_x, ROG, CO, NO_2, and PM_{10} (and possibly SO_2) would still temporarily exceed the significance thresholds.

Public Health and Safety

Significance Criteria

For the proposed project, the significance of the public health and safety risk is determined by the probability of construction workers or members of the general public being exposed to hazardous substances in sufficient concentrations to cause adverse health and safety effects, as defined by Section 25501(k) of Chapter 6.95, Division 20 of the California Health and Safety Code. Other potential health and safety impacts during construction are addressed elsewhere in this chapter: fire protection and crime prevention are addressed in this section under Construction/Community Services and Facilities; impacts related to water quality are described in Construction/Hydrology and Water Quality; and impacts related to air quality are presented in Construction/Air Quality. Exposure to EMF is not addressed in this section because no major sources of EMF are associated with construction activities.

Project-Specific Analysis

1. *Construction of the Aerial Design Option LPA may involve activities that expose workers, the public, and/or the environment to soils, soil gases, or groundwater contaminated with hazardous materials. (S)*

   Line construction techniques during construction could potentially result in discovery of previously undetected hazardous contamination. Activities that could lead to the discovery of contaminated soils and/or groundwater, include building demolition, excavation, grading, and dewatering, depending on the specific site being developed. The chemical compounds that could be encountered would also vary depending on the specific site being developed. In addition, because the Aerial Design Option LPA alignment extends onto SFIA property, there would be potential for rupture of fuel pipelines or underground tanks and exposure to fuel leakage not detected during the site investigation prior to construction. Because this alignment proceeds in an aerial configuration to the proposed SFIA International Terminal, the risk of encountering underground fuel pipelines and storage tanks on the west of Bayshore area is minimized compared to other alignments.

MITIGATION MEASURES. Implementation of the following mitigation measures would reduce potential impacts from exposure to hazardous materials to an insignificant level.

1.1 *Hazardous Materials Contingency Plan.* Prior to right-of-way acquisition, BART will conduct further geotechnical analysis to determine the presence of hazardous materials. If a site is found to be contaminated to an extent that disturbance could pose a significant hazard to residents, workers, or the environment, the site will be avoided, contained or cleaned up. Prior to construction by BART, a Hazardous Materials Contingency Plan will be developed, which will contain specific emergency response procedures to be followed in the event of discovery of previously undetected hazardous contamination. These procedures will be incorporated in the construction specifications and will provide:

    - a list of parties to notify in an emergency with contact numbers,
    - a description of roles parties will play in remediation of hazardous materials,
    - federal, state, and local health and safety guidelines,
    - a description of hazardous materials handling in general terms,
    - steps to take during design, and
    - steps to take during construction.

    BART will ensure that the construction contractor adheres to the specifics of this contingency plan.

1.2 *Site Sampling and Remediation.* In the event that previously undetected contamination is encountered during project construction, soil and/or groundwater samples will be taken to determine the nature and extent of contamination. The potential for impacts relating to exposure to contamination exists for workers directly engaged in the sampling activities of this measure. Adherence to proper personal protective equipment i.e., gloves, coveralls), sample transportation procedures, and site access controls would reduce the likelihood of such exposure to an insignificant level. In general, since relatively small amounts of material are sampled, exposure to potential hazards during site sampling is limited, and associated impacts would be localized. If levels of contaminants found in any site investigation exceed regulatory criteria and/or pose a threat to public health or the environment, as defined by the responsible regulatory agencies, BART would ensure that mitigation activities are performed. Construction should proceed only when risk to public and worker health and safety and environmental health is reduced to acceptable levels, as defined by California OSHA standards.

    Potential impacts could also result from remediation activities. Workers, and possibly the public, could come into contact with chemical compounds in soils, soil gases, or groundwater during site remediation. The public and the environment could be exposed to airborne chemical compounds migrating from a site under remediation. Accidents during transportation of contaminated soils and/or groundwater could lead to exposure of the public and the environment to the chemical compounds. However, if site remediation is found necessary, a site-specific Safety and Health Plan for hazardous materials and waste operations would be prepared and submitted to the San Mateo County Department of Health Services, Environmental Services Division before site activities would proceed, pursuant to federal and California OSHA regulations. The site-specific Safety and Health Plan, which would be

applicable to all activities at the site prior to completion of site remediation, would establish policies and procedures to protect workers and the public from potential hazards posed by hazardous wastes.

2. *Potentially hazardous materials used for equipment maintenance and construction would be introduced into the project corridor. Accidental release of these materials during the construction period may expose workers and the general public to adverse health effects. (S)*

Spills of machinery fluids (such as gasoline, diesel, and oils) or various construction chemicals (such as paints, solvents, and sealers) could contaminate soil, groundwater, or air, leading to acute exposure by inhalation or dermal contact. Exposure to these fluids and chemicals can cause effects such as dizziness, vomiting, and loss of coordination.

MITIGATION MEASURES. The following mitigation measure would reduce the potential of exposure to hazardous materials used during construction activities to an insignificant level.

2.1 *Proper Handling and Disposal*. BART will ensure that hazardous materials are managed as prescribed by Materials Safety Data Sheets (MSDSs) issued by chemical manufacturers and importers, pursuant to the federal OSHA Hazard Communication Standard. MSDSs describe the physical and health hazards of specific chemicals and recommend handling practices. BART will ensure that hazardous materials are managed pursuant to CCR Title 22, Division 4.5, Chapter 20, Environmental Health Standards for the Management of Hazardous Waste, and will require adherence to these practices as a condition of the construction contract.

Cumulative Analysis

Projects with a potential to have cumulative effects on public health and safety during construction of the Aerial Design Option LPA include new industrial activities in South San Francisco and San Bruno, the most likely locations for such development in the vicinity of the project corridor. These industrial activities could potentially involve construction activities, such as excavation, grading, and dewatering, and result in the discovery of previously undetected hazardous contamination. In addition, the SFIA Master Plan EIR identifies hazardous materials use and generation and potential long- and short-term contamination of soil and groundwater associated with proposed SFIA development. While risk of exposure to hazardous materials is not likely under these development scenarios, this risk would be localized (that is, restricted to individual project sites). Since none of these projects are expected to occur within or adjacent to the project corridor where a pathway for contamination could be postulated, hazardous contamination from these projects would not cumulate with potential contamination under the BART extension. The El Camino Corridor redevelopment project is not expected to produce cumulative impacts, since the EIR for that project does not identify hazardous materials risks associated with the proposed residential development of the area.

The Aerial Design Option LPA alignment travels onto SFIA property west of Highway 101 and toward the terminal area, where the SFIA Master Plan identifies construction and demolition projects through the year 2006, including parking lot and facilities demolition, improvements, and additions. It is possible that these projects may increase the risk of exposure to hazardous materials for construction workers and the general public at SFIA during construction of the BART extension, beyond that experienced due to the BART project by itself. This cumulative impact is therefore considered significant. The same project-

specific mitigation measures recommended above, i.e., implementation of a hazardous materials contingency plan, site sampling, and remediation apply to cumulative impacts and would reduce risk of exposure to an insignificant level.

Energy

Significance Criteria and Methodology

Significance Criteria. Construction of the proposed project would constitute a significant project-specific or cumulative impact if it required a significant commitment of nonrenewable energy resources, such as oil, gasoline, and electricity.

Methodology. All transportation modes (such as highways or rail tracks) require guideways. Guideway construction for BART would require a new double- or triple-tracked right-of-way. The amount of energy consumed in the construction of rail guideways is influenced by many factors, the most important being the type of line construction. The four principal types, in order of increasing energy intensity, are at-grade track (19.11 billion Btu per guideway mile), aerial structure (55.63 billion Btu), subways built by cut-and-cover techniques (163.14 billion Btu), and subways built by tunneling (328.33 billion Btu) (Congressional Budget Offices, 1972). Added to these figures is the energy required to construct a station, about 330 billion Btu of energy per station. These energy consumption factors were multiplied by the length of the guideway under the BART extension to estimate the energy required to construct the guideway.

Project-Specific Analysis

1. *Construction of the guideways and stations for the Aerial Design Option LPA is estimated to require a maximum of 981.15 billion Btu per year. (S)*

   MITIGATION MEASURES. The energy required to construct the BART extension would involve substantial amounts of nonrenewable energy resources, such as oil and gas. BART will require the construction contractors to use energy-efficient equipment, but the effect would remain significant and unavoidable.

Cumulative Analysis

The projects comprising the cumulative construction impact analysis within the project corridor, in addition to BART, include the SFIA expansion plans, the Hickey Boulevard extension, and the El Camino Corridor redevelopment project. If construction of these developments occurred simultaneously with BART construction, there would be significant cumulative energy impacts. Actual construction-related energy requirements of these projects are not known. However, it is not expected that cumulative demands for energy would be substantially greater than those required for the construction of BART alone. Nonetheless, these cumulative energy requirements would be significant with construction of the Aerial Design Option LPA. Although BART will require its construction contractors to use energy-efficient equipment, cumulative energy impacts would remain significant.

Chapter 4
Other CEQA/NEPA Topics

4.1 Introduction

This chapter provides a summary of impacts that cannot be mitigated to an insignificant level, a discussion of irreversible and irretrievable commitment of resources, cumulative and growth-inducing impacts, areas of controversy, and issues that must be resolved prior to project approval.

4.2 Unavoidable Adverse Impacts

The impact analysis in Chapter 3 of this document identifies significant impacts and the mitigation measures required to reduce those impacts to an insignificant level. Significant impacts of the Aerial Design Option Locally Preferred Alternative (LPA) are identified below.

Long-Term Effects

Transportation

- The level of service (LOS) of the freeway segment between Millbrae Avenue and Broadway in the A.M. peak hour would deteriorate from LOS E under the No Build Alternative in 1993 to LOS F.

- The Aerial Design Option LPA is forecast to have an adverse impact at one new and three existing intersections during the A.M. or P.M. peak hours relative to the No Build Alternative. This impact would remain significant and unavoidable until proposed improvements are constructed.

- Significant cumulative increases on the freeway segments between SFIA and Third Avenues.

Land Use and Economic Activity

- The loss of approximately 200 households would result in an indirect reduction in tax revenues and income from Millbrae businesses, and a loss of average daily attendance funds in the Millbrae School District. Relocation of displaced households within Millbrae is not expected due to the lack of comparable housing in Millbrae.

- Social patterns of shopping, circulation, and neighborhood activities would be altered in some neighborhoods, due to relocation, and may be difficult to reestablish. This is especially true in the Millbrae Gardens neighborhood in Millbrae where the greatest amount of displacement would occur.

- Lower-income populations would be affected by the loss of affordable housing stock.

Visual Quality

- In the Daly City Shop/Yard, a proposed 8- to 12-foot sound wall around the turntable would create a sense of encroachment or enclosure for nearby residents in the Meadowbrook Trailer Park.

- The elevated guideways of the aerial wye-stub north and south legs would alter the visual setting and detract from the SFIA property west of Highway 101 (also referred to as the west of Bayshore parcel) as a scenic, open space resource.

- The Millbrae Avenue Station facilities would be incompatible in scale with the low-profile homes in the Bayside Manor neighborhood north of Millbrae Avenue and the commercial buildings to the south. Nighttime illumination of the parking areas may be intrusive to nearby residents.

Short-Term Effects

Construction/Transportation

- Cut-and-cover construction at Chestnut Avenue would reduce street capacity and interfere with operations at the El Camino Real/Mission Road intersection.

- The subway section across South Spruce Avenue would result in partial closure of these streets and impact traffic, transit, pedestrian, and bicycle circulation.

- During excavation of the cut-and-cover subway section, several streets in downtown San Bruno would be partially closed for two to four months, potentially affecting traffic and pedestrians.

Construction/Land Use

- Construction activities would temporarily disrupt activities at the cemeteries.

- Construction activity would disrupt normal vehicular access to businesses on Serramonte Boulevard east of the right-of-way.

- Construction laydown area Alternative A would displace the community gardens located immediately south of Lion's Field Park.

- Construction of the Millbrae Avenue Station would cause a significant increase in activity, thereby detracting from the quality of life in the Bayside Manor neighborhood.

Construction/Visual Quality

- Cut-and-cover construction through Colma and clearing of laydown/mobilization areas would result in the removal of mature trees identified as scenic resources. Until the replacement landscaping reaches maturity, the impact to scenic resources would be significant.

- Construction of the sound wall at the Daly City Shop/Yard would occur within 60 feet of residences in the Meadowbrook Trailer Park.

- Construction activities would occur within 60 feet of identified sensitive receptors in South San Francisco, resulting in a perception of encroachment.

- The groves of mature eucalyptus trees, identified as scenic resources in South San Francisco, would be removed.

- Construction would constitute a noticeable change in the visual setting in the Belle Air and San Bruno Park neighborhoods. This construction would occur within 60 feet of homes along Huntington Avenue in the Fifth Addition neighborhood and would result in a perception of encroachment.

- The SFIA west of Bayshore parcel would be temporarily altered by construction activities for the aerial alignment; these activities would detract from views of this area and of San Bruno Mountain from both San Bruno and Millbrae neighborhoods.

- Construction of the Hillcrest Boulevard grade separation would occur within 60 feet of sensitive receptors in the Millbrae Manor and the Bayside Manor neighborhoods.

Construction/Community Services

- Construction of the Millbrae Avenue Station would limit access to the Bayside Manor neighborhood, which could slow emergency response times.

Construction/Air Quality

- Construction-related emissions of nitrogen oxides, nitrogen dioxide, reactive organic gases, carbon monoxide, and particulate matter (PM_{10}) would exceed their respective significance thresholds for non attainment pollutants.

Construction/Energy

- A maximum of 981.15 billion British thermal units (Btu) per year of nonrenewable energy would be required.

4.3 Irreversible and Irretrievable Commitment of Resources

The Aerial Design Option LPA would require an irretrievable commitment of energy resources. Construction and operation would result in the direct consumption of petroleum fuels and electricity. The Aerial Design Option LPA would require 560.37 million Btu of energy per day to operate.

4.4 Summary of Significant Cumulative Impacts

Cumulative effects are those resulting from future growth (projected by Association of Bay Area Governments [ABAG] in *Projections '94*) in combination with the Aerial Design Option LPA and other related projects. Other past, present, and reasonably foreseeable future projects include the development envisioned by the SFIA Final Draft Master Plan. Cumulative effects are also presented in Chapter 3.

Transportation

- Traffic would increase peak-hour volumes in 1998 and 2010 on Highway 101 between the SFIA and Third Avenue freeway segments that would already operate at unacceptable levels of service under the No Build Alternative. This cumulative impact would remain significant and unavoidable.
- The Aerial Design Option LPA would worsen congestion along the weaving sections between the northbound loop out-ramp and off-ramp connecting Millbrae Avenue and Highway 101. This cumulative impact can be mitigated to a less than significant level.
- Significant congestion would occur at the El Camino Real/Sneath intersection. This cumulative impact can be mitigated to a less than significant level.
- Beneficial effect of a reduction in parking demand at Daly City and Colma BART stations.

Land Use

- The Aerial Design Option LPA, in conjunction with the El Camino corridor redevelopment activities would result in a cumulative reduction of the housing stock and businesses in South San Francisco. This cumulative impact can be mitigated to a less than significant level.
- Increased noise and traffic associated with BART, increased CalTrain service, and the SFIA expansion would affect the Belle Air and Fifth Addition neighborhoods in San Bruno. This cumulative impact would remain significant and unavoidable.

Visual Quality

- The visual setting in South San Francisco would be altered by more intense development associated with the El Camino Corridor Redevelopment Project, the Hickey Boulevard extension project, and BART. This cumulative impact can be mitigated to a less than significant level.

- The undeveloped, natural appearance and views of the SFIA property west of Highway 101 would be altered by the aerial guideways for BART, in combination with the new highway ramps into and out of the airport. This cumulative impact would remain significant and unavoidable.

Community Services

- Background growth, in combination with the Aerial Design Option LPA, would increase demand for water, and wastewater treatment services. This cumulative impact can be mitigated to a less than significant level.

Geology, Soils and Seismicity

- Background growth and development, including transportation improvements like BART, would increase the number of people and structures exposed to seismic hazards, which are characteristic of the region. This cumulative impact can be mitigated to a less than significant level.

Biological Resources

- Wetlands and foraging breeding habitats for the San Francisco garter snake, California red-legged frog, and San Francisco forktail damselfly would be lost and/or degraded in the project corridor. This cumulative impact can be mitigated to a less than significant level.

Hydrology and Water Quality

- Proposed development around the Hickey Station could increase nonpoint source pollution and stormwater runoff. This cumulative impact can be mitigated to a less than significant level.

Noise and Vibration

- Noise levels in the Lomita Park neighborhood of San Bruno would increase.

Air Quality

- Regional emissions would diminish due to reductions in vehicle miles traveled (VMT), a positive cumulative effect.

Energy

- Beneficial effect of a net decrease in regional energy requirements due to increased public transit ridership.

Construction

- Exposure of South San Francisco neighborhoods and the SFIA to increased dust, noise, construction traffic, movement of construction equipment, and visual disruption. This cumulative impact would remain significant and unavoidable.

- Potential delay in response times for police and fire department services in Colma, South San Francisco, San Bruno, Millbrae, and the SFIA. This cumulative impact would remain significant and unavoidable.
- Potential utility service interruptions in the vicinity of the project corridor.
- Potential construction-related settlement and erosion in South San Francisco and/or on SFIA property.
- Loss and/or degradation of wetlands and sensitive species habitats in the project corridor. This cumulative impact can be mitigated to a less than significant level.
- Erosion and sedimentation that may trigger water quality degradation.
- Increase in airborne emissions of NO_X, ROG, CO, NO_2, PM_{10}, and SO_2,.
- Increased risk of exposure to hazardous materials for construction workers and the public at the SFIA.
- Increased energy demand during the construction period. This cumulative impact would remain significant and unavoidable.

4.5 Growth-Inducing Impacts

As required by Section 15126(g) of the California Environmental Quality Act (CEQA) Guidelines, this section discusses the growth-inducing effects of a BART–San Francisco Airport Extension. A project is considered growth-inducing if it could directly or indirectly foster economic or population growth or the construction of additional housing. For example, extension of urban services or transportation facilities into previously unserved or underserved areas, or removal of obstacles to growth and development, are considered factors that contribute to growth inducement. Growth could occur in the form of land development or increased numbers and concentrations of housing and jobs. To estimate direct and indirect construction and permanent employment, ABAG's multipliers have been used. For every construction job required to build BART, 1.44 direct and indirect positions would be created in the region. For every permanent job created by BART, 1.25 direct and indirect positions would result.

Transportation projects can have a wide range of growth-inducing effects. A project may hasten growth in certain areas, retard it in others, intensify development in certain locations, or shift growth from one locality to another. Other factors, particularly local planning and community standards or environmental initiatives, may also direct the location and timing of transportation investments.

Generally, transportation improvements support growth, whereas land use development generates new travel demand and the need for new transportation capacity. In other words, projects like the proposed BART extension in an already developed corridor tend to respond to and accommodate, rather than induce, new growth. ABAG projects substantial population and employment growth in San Mateo County over the next 20 years. These forecasts continue to show that a large proportion of county residents will travel to other counties to work. The BART–San Francisco Airport Extension has been proposed in response to this growth.

This notwithstanding, new development can spring from improved transit services and accessibility. The Aerial Design Option LPA would result in improved accessibility to a particular city and/or site. Proximity to BART offers major access improvements, and thus BART's presence in the corridor is likely to enhance development. This development may occur regardless of the extension, but the location and intensity of growth may shift to take advantage of the access afforded by BART. Population or employment growth could, in turn, tax existing community services and facilities. The growth-inducing impacts of the proposed project are presented below.

Jobs. The Aerial Design Option LPA would trigger 1,500 to 2,000 person years of construction-related work and 300 to 500 permanent transit employment positions, or 3,660 to 4,880 direct and indirect construction-related positions and 675 to 1,125 direct and indirect permanent positions.

Station Area Development. The existence of a BART station and improved regional accessibility could stimulate nearby development and incrementally increase housing demands in the vicinity of the Hickey Station. South San Francisco proposes intensification of residential use and a possible commercial development in anticipation of the Hickey Station. Such use would help fulfill the *El Camino Corridor Redevelopment Plan* and the city's General Plan Amendment, which anticipate higher densities and intensification of residential use in the station vicinity. New development or population growth in the vicinity of the Tanforan Station is not likely because the area is generally built out with few opportunities for intensification or redevelopment. However, the Tanforan Station could enhance pedestrian flow and foster revitalization/market efforts at the shopping center. Although the SFIA Master Plan does not provide for a BART station on the east side of Highway 101, the proposed Airport International Terminal Station would not be expected to induce growth in the SFIA vicinity. The area surrounding the proposed Millbrae Avenue Station is largely built out; nonetheless, a BART station in this location could stimulate development in this area of Millbrae. The Millbrae Avenue Station is consistent with the Millbrae Avenue Station Area Concept Plan and supports the city's efforts to encourage future joint use and economic development opportunities around the station.

4.6 Areas of Controversy

The following is a summary of controversial issues that have been identified at BART, SamTrans, and San Francisco Airports Commission meetings for the Aerial Design Option LPA. In addition, this section includes concerns commonly raised by the public during the public review period. While many of these latter controversies are mitigated, they remain as significant concerns for many residents and business people.

- **CalTrain Connectivity.** Impacts to the approximately 10 percent of rail patrons to the SFIA who will need to transfer to BART at the Millbrae Avenue Station and to the Airport Light Rail System on airport property.

- **Construction Impacts.** Extent and duration of construction activities because of disturbances to local circulation, noise and dust, and pedestrian safety, particularly for school-aged children in South San Francisco, San Bruno, and Millbrae.

- **Displacement Impacts and Corresponding Loss in Revenues.** Property acquisition, disruption of existing neighborhoods, loss of business access and parking, loss of municipal property tax revenues associated with displacement, and loss of revenues for the school districts due to relocation of students.

- **Local Circulation.** Traffic impacts along local streets as a result of BART passengers seeking to access the stations.

- **SFIA Property west of Highway 101.** Loss of wetlands and habitat for the San Francisco garter snake and potential flood impacts.

4.7 Issues to Be Resolved

The following critical decisions must be made prior to the implementation of the BART–San Francisco Airport Extension:

- **Determination of Federal and SFIA Funding Contributions.** BART, SamTrans, and the Metropolitan Transportation Commission are working closely with the Federal Transit Administration and SFIA to determine appropriate funding for the Aerial Design Option LPA.

- **Selection and Adoption of Appropriate Mitigation Measures.** Mitigation measures have been developed to reduce and/or eliminate significant impacts in all areas of the environmental analysis. The BART and SamTrans boards will identify the specific measures that will be incorporated into the Mitigation Monitoring Program.

Chapter 5
Section 4(f) Evaluation

5.1 Introduction

Section 4(f) of the Department of Transportation Act of 1966 (49 USC 1653[f]) declares a national policy to preserve the natural beauty of the countryside, public park and recreation lands, wildlife and waterfowl refuges, and historic sites. Section 4(f) permits the Secretary of Transportation to approve a project that requires the use of publicly owned land from a park, recreation area, or wildlife refuge, or any land from a historic site of national, state, or local significance only if the following determinations have been made: there is no feasible and prudent alternative to the use of such land, and all possible planning has been undertaken to minimize harm to the 4(f) lands resulting from such use. Section 4(f) evaluation is required of federal transportation projects; it is not required by the California Environmental Quality Act (CEQA).

The Section 4(f) evaluation was used in the decision-making process by the BART and San Mateo County Transit District (SamTrans) boards and the Federal Transit Administration (FTA) to refine the Locally Preferred Alternative (LPA). BART engineering staff have further evaluated localized alignment options (vertical and horizontal) and construction techniques in the general area of each Section 4(f) resource in an effort to avoid the resource. BART also consulted with the public agencies that own the resources, in developing measures to minimize harm.

As there are no wildlife or waterfowl refuges in the project corridor, this final Section 4(f) evaluation examines parklands and historic sites in relationship to the Aerial Design Option LPA (see Chapter 2 of this document for a detailed description of the Aerial Design Option LPA). The U.S. Department of Interior has been consulted regarding the identified parkland and cultural effects, alternatives, and measures to minimize harm and concurs with the evaluation presented (see Volume V of this FEIR/FEIS).

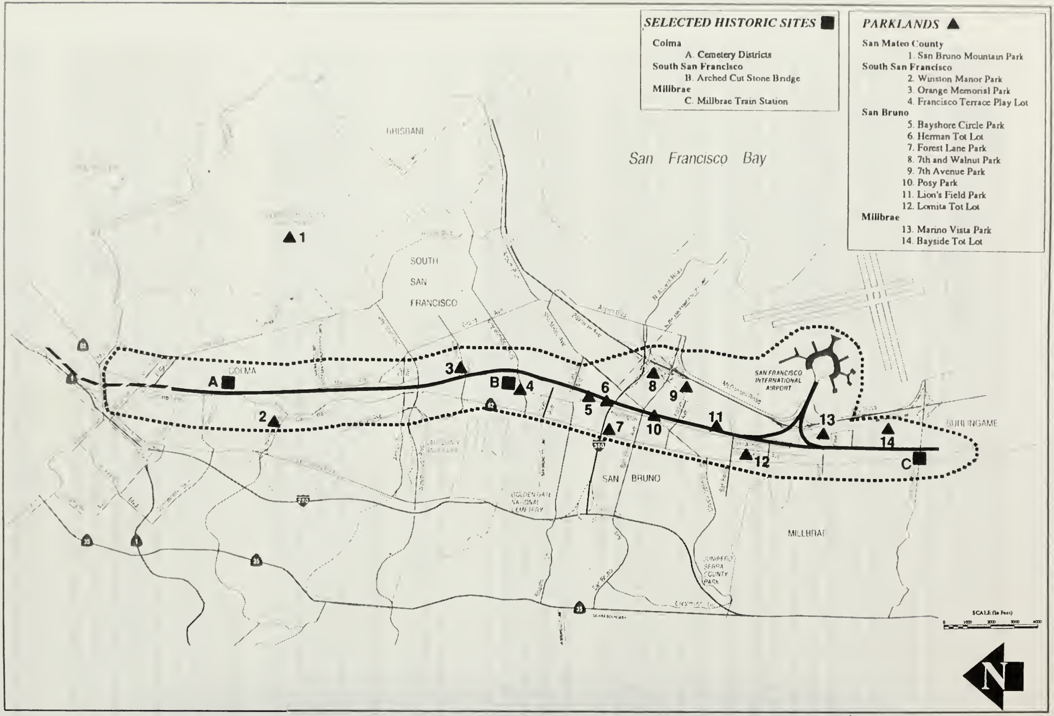
5.2 Description of Parklands and Potential Effects

Parklands in the Project Corridor

As presented in Figure 5-1, fourteen public parks located within the boundaries of the BART extension project corridor were reviewed. Based on project alignment and construction scenario refinements, the Aerial Design Option LPA would not involve permanent use of any Section 4(f) parklands. However, during construction, Lion's Field Park may experience a "constructive" use, as described below.

Definition of Use

For the Section 4(f) analysis, there are two types of "use." The first involves the permanent "taking" or acquisition of land (i.e., acquisition through fee simple or a permanent easement) for a proposed transportation project, which is considered a direct impact. A take would also occur if project construction required temporary removal of protected parkland, where such removal or occupancy would interfere with regular park activities (i.e., acquisition through a temporary easement). The second type of use is a "constructive use." This type of use occurs when land is not taken, but the proximity of the park to the alignment creates impacts such that the protected activities, features, or attributes that qualify a



OGDEN

Parklands and Historic Resources within the Project Corridor for Section 4(f) Evaluation

FIGURE 5-1

resource for protection under Section 4(f) are substantially impaired. Constructive use would normally involve indirect or secondary effects to a resource, such as an increase in noise or vibration levels, restriction of access, and/or visual intrusion.

Based on the above definitions and considerations regarding use, no Section 4(f) parklands would be acquired under the Aerial Design Option LPA. This is because, under BART's revised construction scenario for the Aerial Design Option LPA, developed in conjunction with public comments, impacts that were identified in the Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (DEIR/SDEIS) and the Focused Recirculated Draft Environmental Impact Report/Supplemental #2 Draft Environmental Impact Statement (FRDEIR/S#2DEIS) at Francisco Terrace Play Lot in South San Francisco and at Bayshore Circle Park in San Bruno are no longer expected.

Section 4(f) Effects

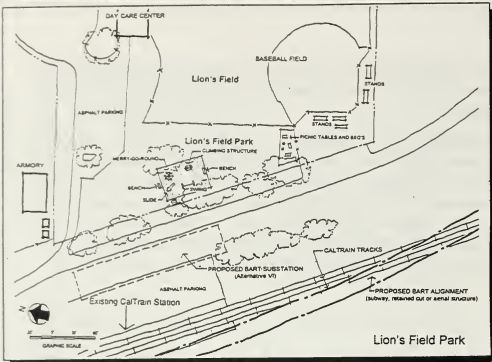
Lion's Field Park

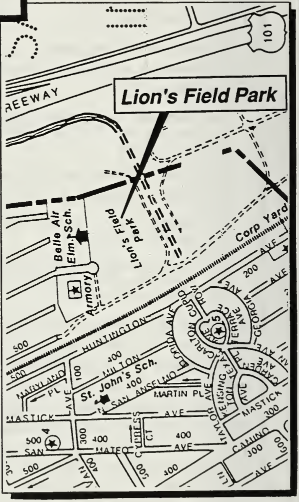
Description of Affected Section 4(f) Property. This approximately 4.5-acre park is owned by the City of San Bruno. It is located at the south end of 3rd Avenue and adjoins the Belle Air Elementary School grounds (Figure 5-2).

- **Facilities**. A baseball diamond, restrooms, play equipment, picnic tables, a drinking fountain, and benches. The Latchkey Alternative Daycare Center is also located at the park in a converted fire station.
- **Planned Additional Facilities.** None.
- **Access**. Pedestrian and vehicle access is from 3rd Avenue.
- **Usage**. No exact usage figures are available beyond a statement from city staff that the park receives high usage.
- **Relationship to Other Parks in the Area.** The 7th Avenue Park is located about 0.3 miles north; San Bruno City Park, which is considerably larger than Lion's Field Park, is about 0.7 miles to the southwest.

Proposed Use. During construction of the Aerial Design Option LPA, one of three proposed contractor laydown areas would occupy sites adjacent to or near Lion's Field Park. None of the laydown areas would require use of parkland; thus, there would be no direct impacts. The first, Alternative A, is approximately 1.4 acres at the community gardens immediately south of the park. The Alternative B laydown area, approximately 3.0 acres, is located east of Lion's Field Park and the Belle Air Elementary School in the open area under and adjacent to the existing PG&E transmission lines. The Alternative C laydown area is approximately 3.0 acres and lies south of the Alternative A laydown area, just south of Cupid Row Canal and east of the CalTrain tracks. There are optional access routes to these contractor laydown areas. One option involves routing trucks along 1st Avenue, along the west side of the park. The second option would route trucks to a direct road running north-south between Highway 101 and the Belle Air Elementary School. The route would be within 100 feet of the south side of the park, at its closest point. As seen in Figure 5-2 this route would run along the baseball field; more sensitive uses such as the picnic area and children's playground are sited further north in the park.

Use of any of these sites could increase noise and possibly dust levels in the park due to truck traffic, estimated at 14,400 truck trips over 45 months. Neither of these effects would detract from the use and enjoyment of the park for baseball games, which currently occur in the afternoons and evenings.





![OGDEN logo]

Lion's Field Park

FIGURE 5-2

However, in the mornings, the park is heavily used by small children and care providers. It is reported that adults enjoy passive activities such as socializing and sitting on the park benches. The proximity of the Alternative A laydown area and the 1st Avenue access route may constitute a noise and visual intrusion that would interfere with use of the park, particularly since the anticipated construction duration would be 45 months. As a result, Lion's Field Park may experience a "constructive use." Alternatives B and C would avoid this constructive use but would disturb between 0.70 and 1.5 acres of wetlands.

Alternatives Considered. To avoid possible constructive use of the park associated with construction activities, the preferred contractor laydown area is Alternative C, and the preferred route to San Bruno Avenue is via a dirt road between Highway 101 and Belle Air Elementary School. This location for the contractor laydown area is further from Lion's Field (230 feet at its closest point compared to Alternative A which would abut the park), thereby reducing noise, dust, and visual effects. The proposed access route to and from the site would run south and east of the park and thus not detract from use and enjoyment of the public recreation areas (compared to the 1st Avenue route which would run within 30 feet of the playground). This access option would, however, require negotiations with and approval by Caltrans. However, selection of Alternative C would result in other impacts. In particular, it lies in an area considered high quality habitat for the endangered San Francisco garter snake by the U.S. Fish and Wildlife Service.

Alternative B would be adjacent to the Belle Air Elementary School and disturb the school and nearby residences in the Belle Air neighborhood. The disturbance would primarily be dust, noise, and traffic. This laydown site is also considered by the U.S. Fish and Wildlife Service as habitat for the endangered San Francisco garter snake.

Planning and Mitigation Measures. To minimize potential effects, the following measures are recommended regardless of the selected laydown area and access route:

- coordination of vehicle routes and construction activities with local authorities to ensure neighborhood safety and minimize traffic, dust, and noise impacts;
- additional traffic controls where construction traffic enters major streets;
- acceleration and deceleration lanes to facilitate merging of construction traffic with Highway 101 traffic;
- erection of temporary noise barriers where construction noise criteria cannot be met with available equipment; and
- application of Best Management Practices to suppress dust.

If the 1st Avenue access route were selected, the following additional measures are recommended:

- restriction of parking to one side of 1st Avenue to maintain continuous two-way traffic during construction would also be needed to mitigate local circulation impacts;
- restriction of traffic from 1st Avenue and create a temporary haul route between 1st Avenue and the CalTrain tracks; and
- construction of a temporary noise barrier on either side of the temporary haul route.

Coordination. On July 17, 1995, the City of San Bruno Department of Parks and Recreation was consulted regarding impacts to Lion's Field Park. Director O'Shea concurred with the presentation of potential impacts, alternatives, and mitigation measures presented in the FRDEIR/S#2DEIS for Lion's Field Park. Director O'Shea noted that loss of Lion's Field Park would be very significant, since its usage is high and there are no nearby facilities that could satisfy active recreational needs (O'Shea, 1994).

Furthermore, the latchkey program at the daycare center is very popular, and Director O'Shea is unaware of any facilities that could provide similar programming.

Other Parklands Possibly Affected but Not Used

Four parks are located in the project corridor within 250 feet of the Aerial Design Option LPA's construction right-of-way: Orange Memorial Park, Francisco Terrace Play Lot, Bayshore Circle Park, and Posy Park. While indirect construction noise, dust, and visual effects would occur near these parks, effects would not substantially impair the activities, features, or attributes of the parklands.

- **Orange Memorial Park.** This park is separated from the construction easement by Memorial Avenue. A baseball diamond is located along the western frontage of the park, nearest the construction activities, and construction would not be expected to detract from this use. In addition, cut-and-cover construction alongside the park would be completed within three months, so that any effects would be short term. Although West Orange Avenue, a primary access road to the park, would be reconstructed and temporarily reduced to one lane, the street would remain open.

- **Francisco Terrace Play Lot.** This small, neighborhood park abutting the construction easement to the east and South Spruce Avenue to the south would have been affected, prior to design refinements adopted by BART at the suggestion of South San Francisco. The 1992 and Alternative VI LPAs called for the BART subway alignment to rise to the surface at South Spruce Avenue, requiring that the street be elevated. The change in the street contour required a retaining wall to be erected along the south side of Francisco Terrace Play Lot and temporary use of the play lot to construct the wall. The Aerial Design Option LPA avoids this permanent alteration to the park's setting by maintaining the alignment in subway and avoiding any changes to South Spruce Avenue's profile. The only effects to the park are short-term construction effects. Noise and dust would be noticeable during construction of the cut-and-cover line segment. The line segment near the park would be completed within two months, and South Spruce Avenue would be restricted from four to two lanes, but not closed. The effects would be temporary, and standard construction practices, such as construction site watering to reduce dust and adherence to construction noise standards, would minimize the severity of these short-term impacts.

- **Bayshore Circle Park.** Like Francisco Terrace Play Lot, this one-acre park had been within the construction right-of-way. Since release of the FRDEIR/S#2DEIS, BART has further evaluated its construction requirements and determined that this site is no longer needed as a staging area. Bayshore Circle Park is approximately 250 feet east of the construction easement and is separated from construction activities by adjacent residences. Thus, construction-period noise, dust, and visual effects would not affect enjoyment of this neighborhood park.

- **Posy Park.** This small, open space area at the intersection of Huntington and San Mateo Avenues is separated from the construction right-of-way by Huntington Avenue. Posy Park is already situated at a busy intersection and exposed to CalTrain passbys. BART would not alter this setting, since the alignment passes the park in subway. Construction-period impacts would be short term, as cut-and-cover construction would progress at about 100 feet per week and should be completed in the vicinity of the park within two months. Huntington and San Mateo Avenues would be reconstructed and the number of cars reduced by half, but access would be

maintained at all times. Consequently, the enjoyment of the park would suffer only temporarily during construction and, in the long term, there would be no constructive use of Posy Park.

5.3 Description of Historic Sites and Potential Effects

Historic Sites in the Project Corridor

Five individual historic properties and five historic districts (including four cemetery districts) in the project corridor were identified as listed or potentially eligible for the National Register of Historic Places (NRHP). The Historic Architectural Survey Reports and the Historic Resources Evaluation Report, technical reports to the DEIR/SDEIS and the FRDEIR/S#2DEIS, were forwarded to the State Historic Preservation Office (SHPO) for a determination of the eligibility of these properties for inclusion in the National Register.

Of these resources, one property is already on the National Register (Millbrae Train Station), one has been found previously to be eligible (Old Colma Railroad Station), and seven properties were determined by SHPO to be eligible for inclusion on the NHRP. The last property, considered possibly eligible as a district (the Lagomarsino Farm District) in the draft environmental documents, was found to have insufficient documentation for listing.

Pursuant to Section 106 of the National Historic Preservation Act, only one of the nine historically significant properties would be adversely affected by the BART extension: the arched, cut-stone bridge in South San Francisco (see Section 3.4, Cultural Resources, of this volume).

The properties where no adverse effects were identified include:

- Cypress Lawn Memorial Park in Colma,
- Italian Cemetery District,
- Home of Peace Cemetery and Hills of Eternity Memorial Park Cemetery District,
- Holy Cross Cemetery,
- Salem Memorial Park Office Building,
- Old Colma Railroad Station,
- 1940s bungalow-style residence (540 San Antonio Avenue), and
- Millbrae Train Station.

One prehistoric archaeological site is known to have existed within the Area of Potential Effects, an area defined in accordance with applicable federal regulations. Evidence that this resource still exists could not be found during investigations performed for the DEIR/SDEIS. Because of past disturbance in the vicinity of the site (CA-SMA-299), it is not expected to yield important prehistoric or historic information and therefore would not qualify for inclusion in the National Register.

Definition of Use

The applicability of Section 4(f) to historic sites is directly related to the Section 106 process described in Section 3.4, Cultural Resources. If the State Historic Preservation Officer (SHPO) determines there is an

adverse effect to a property that is listed or potentially eligible for listing in the National Register in accordance with Section 106 guidelines, then that property is also subject to Section 4(f) review, in which case "use" is defined in the same manner as discussed for parklands (see Section 5.2, above). If the SHPO determines there is no effect or no adverse effect, then Section 4(f) would not apply. Accordingly, the only Section 106 property subject to Section 4(f) review is the arched, cut-stone bridge.

Section 4(f) Effects

Arched, Cut-Stone Bridge

Description of Affected 4(f) Property. This small stone bridge or culvert owned by Southern Pacific Transportation Company (SPTCo) is located in the SPTCo right-of-way just north of South Spruce Avenue. It was constructed in 1863 to channel winter runoff under the old San Francisco–San Jose Railroad. The method of construction, materials used, and the plan, style, proportion, and form are distinctive. It is an important example of California building practices during the 1860s and is associated with the construction and operation of the San Francisco–San Jose Railroad (Figure 5-3).

Proposed Use. BART construction in the South Spruce Avenue area calls for removal of the bridge. The BART alignment would be constructed in cut-and-cover at a level below the existing bridge, approximately 10 to 15 feet below the structure. Construction at this subsurface level allows BART to coordinate construction with future improvements at South Spruce Avenue and Colma Creek further north. Upon completion of subsurface BART construction, a new concrete culvert meeting seismic and other codes would be built, and the functional use of the culvert would remain.

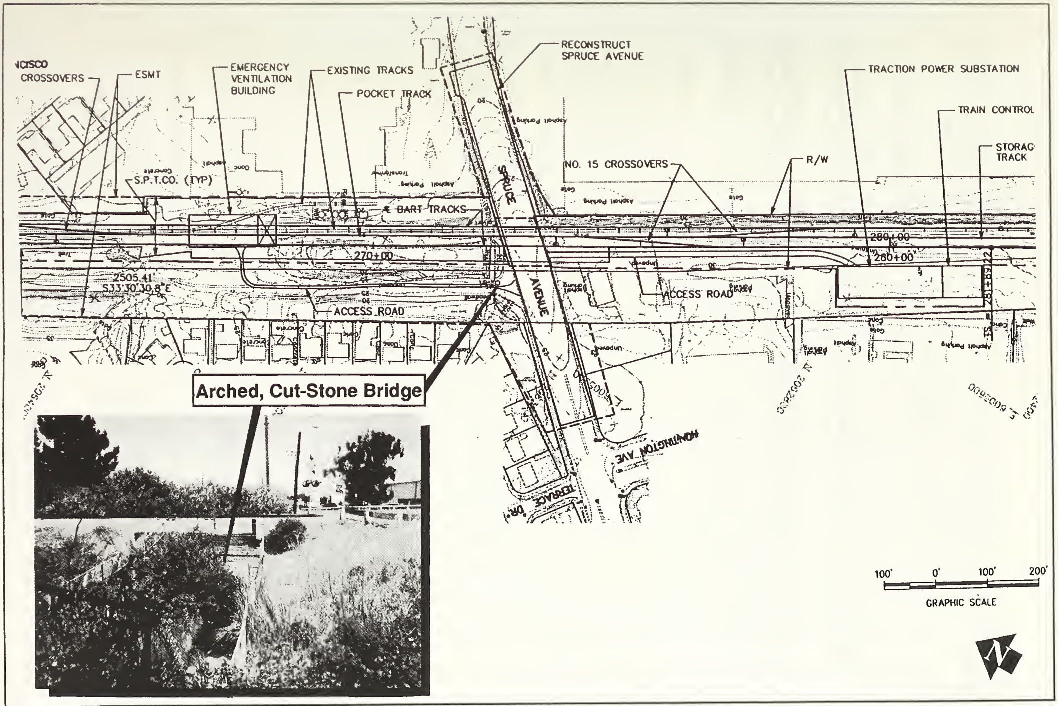
Alternatives Considered. Alternatives to removal and reconstruction of the cut-stone bridge were examined prior to preparation of this FEIR/FEIS and include:

- Relocation of the project alignment to the east or west to avoid the bridge, but this shift would have required removing the BART track from the existing railroad alignment and resulted in costly right-of-way impacts;
- Suspension of the bridge while performing construction underneath was considered, but it was concluded to be a safety hazard and would not have been an acceptable construction practice. The integrity of the bridge could not withstand vibration or other subsurface activity while in suspension.
- Replacement of the entire bridge, but this was rejected because the amount of reinforcement necessary to bring it into compliance with applicable building codes would not have allowed for reconstruction without significant alteration. Also, as the bridge is now connected to and hidden by existing infrastructure for South Spruce Avenue and the existing culvert system, this type of replacement would not be practical and would not likely expose any additional views of the bridge.

Given the significance of the project in the context of regional transportation needs, implementation of the No Build and non-BART alternative modes to avoid the structure were not considered viable alternatives.

Based on these considerations, no feasible and prudent alignment or site-specific alternatives have been identified.

Planning and Mitigation Measures. The proposed mitigation for the adverse effect of this undertaking on the cut-stone bridge includes dismantling the bridge and reconstructing the visible headwall in approximately the same location. The new bridge may be somewhat wider, but reconstruction would



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Arched, Cut-Stone Bridge

FIGURE 5-3

allow for continued visibility of the headwall. The appearance of the cut-stone bridge as it is seen looking north from South Spruce Avenue would be restored, and the existing visual aspects of the structure would be preserved. Specific mitigations included in the Memorandum of Agreement signed by BART, SamTrans, FTA, SHPO, and the Advisory Council on Historic Preservation are:

- Prior to the removal of this bridge, it will be recorded as part of the National Park Service's Historic American Engineering Record.
- The visible headwall of the bridge will be dismantled under the supervision of an expert professional stonemason, and the stones will be piece-marked so that they can be reassembled with the original placement of stones under the direction of the stonemason.
- A new bridge in compliance with current engineering standards and codes, will be constructed of concrete. This concrete bridge will not be visible to passers-by. The original headwall would be reconstructed in its original position if possible so that the resulting new bridge will look virtually the same as the original.
- BART will provide a marker or display identifying the bridge location and its historical significance, and place the marker along a bike path, if implemented.

Chapter 6
Financial Analysis

6.1 Financial Analysis

The financial analysis presented in this section is based on current conceptual cost estimates for the Aerial Design Option LPA. This section also describes expected sources of project funding and the proposed financing structure.

The process of formulating the financial plan and determining the project's funding has paralleled development of the environmental analysis presented in this FEIR/FEIS. The final financial plan, including project costs, funding mechanisms and project financing, will be made available as soon as it is completed.

Estimated Capital Costs

As directed by the U.S. Congress and MTC, BART and SamTrans developed the Aerial Design Option in order to reduce project costs below the $1,269 million estimated for Alternative VI. Table 6-1 presents conceptual capital costs for the right-of-way, line, stations, systems, and mitigation for environmental impacts of the Aerial Design Option LPA, estimated in 1996 dollars (excluding financing costs and escalation). These estimates developed from review of contracts for recently completed BART extensions and from preliminary engineering documents prepared for the Aerial Design Option LPA.

Costs of vehicle procurement and allowances for "soft" costs (i.e., engineering services and insurance) were added to develop a total conceptual capital cost estimate of $1,070 million in 1996 dollars for the Aerial Design Option LPA. This total cost estimate reflects BART participation in FTA's Turnkey Demonstration Program, where use of the design/build process is expected to result in savings in final engineering, BART administration, and project management costs.

Previous conceptual cost estimates for other proposed project alternatives did not include financing costs and escalation, as such costs are uncertain during the early stages of project development. To remain consistent with previously estimated capital costs and to provide a common basis for comparison with other proposed alternatives analyzed in the DEIR/SDEIS and the FRDEIR/S#2DEIS, the $1,070 million total conceptual capital cost estimate for the Aerial Design Option LPA does not include financing costs or escalation.

The capital cost estimate for the Aerial Design Option LPA has been revised to $1,167 million (in 1997 dollars). This figure includes $40 million for financing costs, and $57 million for escalation to a 1997 dollar cost basis and adjustments for the on-airport portion of the project.

Estimated Operations and Maintenance Costs

Estimated operations and maintenance (O&M) costs were developed using BART system operating assumptions from all extensions in operation (Colma, East Dublin, and Pittsburg/Bay Point). These operating assumptions are described in Chapter 2 of this FEIR/FEIS.

Table 6-1
Estimated Capital Costs of BART–San Francisco Airport Extension
Aerial Design Option LPA
Conceptual Cost Estimate, 60-Month Schedule
Millions of 1996 Dollars

	1996
Right-of-Way(1)	$123.7
Line Costs(2)	247.7
Stations(3)	200.6
Systems	92.0
Vehicles	
BART Vehicles	104.6
SamTrans Vehicles	1.6
Engineering Services	186.3
Mitigation of Environmental Impacts(4)	9.8
Contingencies & Reserves	77.8
Insurance	25.9
Estimated Project Total(5)	**$1,070**

Source: BART West Bay Extensions, 1995.
Notes: 1. "60-month schedule" begins with project approval and continues to beginning of pre-revenue service. Actual construction begins with letting construction contracts and continues to beginning of pre-revenue service.
2. The allocation of conceptual costs in this table does not represent distribution of contract amounts which will be established by the contract implementation plan.
1) Includes mitigations associated with purchase of land in Millbrae for street widening, cultural resource preservation, biological mitigation, noise mitigation, and relocation costs.
2) Includes mitigations associated with road modifications, sound walls, landscaping, and construction measures designed to mitigate noise and vibration impacts.
3) Includes hydrological mitigation measures.
4) Covers mitigation costs for biological impacts associated with airport property west of Highway 101.
5) Does not include the costs for additional escalation and the cost of financing the federal funding share.

Systemwide BART costs are estimated at approximately $273.8 million per year in 2010 (in 1996 dollars) under the TSM assumptions, which account for the Colma extension but do not include stations further south. For the Aerial Design Option LPA, annual O&M costs systemwide are estimated at $308.2 million (in 1996 dollars). Excluding costs for the remainder of the system, O&M costs for the Aerial Design Option LPA alone are estimated at $34.4 million in 2010 (in 1996 dollars). This estimate has been adjusted to $62.3 million by escalating 1996 dollars to 2010 dollars and adding the operating costs of the Colma extension in 2010. However, actual O&M costs in the years immediately following the opening of the extension would be less than the estimated 2010 (in 1996 dollars) annual expenditures, because currently projected vehicle availability constraints at opening would limit actual headways to 15 minutes on the two lines serving the extension.

Per the existing and proposed amendments to the BART-SamTrans Comprehensive Agreement, O&M costs for the extension will be the responsibility of SamTrans. BART and SamTrans expect that the farebox recovery rate for the extension would be approximately 85 percent, meaning that 85 percent of O&M costs are projected to be covered by fares on the extension. The remaining 15 percent, or approximately $6 million in 2010, can be covered by a surcharge on the extension.

Under proposed amendments to the BART-SamTrans Comprehensive Agreement, a surcharge may be imposed by mutual agreement between BART and SamTrans at all or some of the extension stations. Surcharge income is estimated at $10.5 million, if imposed at all stations along the extension. This amount would exceed the remaining $6 million in 2010 O&M costs not covered by the expected farebox recovery.

Funding Sources and Proposed Funding Plan

The primary source of funding is expected to be FTA's New Rail Starts Program (49 U.S.C. § 5309). FTA's funding share was projected to be $653 million in 1996 dollars (excluding financing costs and escalation). FTA's funding share is currently expected to be $750 million, which includes a 1997 cost basis and $40 million in financing costs.

The remaining project funds would come from five additional sources. SFIA has committed to contribute a maximum of $200 million. SamTrans would contribute $99 million, and State Transit Capital Improvement (TCI) and State Transportation Improvement Program (STIP) funds are projected to be $98 million. West Bay toll bridge revenues and State Proposition 116 Rail Bond funds are projected to be $10 million each.

Federal Funding for Project

As noted above, FTA's New Rail Starts funds are expected to provide the primary share of project costs, pursuant to 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) legislation. The federal share of the project is currently expected to be $750 million.

Section 3032 of ISTEA authorized $568.5 million for three projects in the Bay Area (the BART Colma extension, the SFIA extension, and the Tasman Corridor Project in Santa Clara County). Section 3032 provides that FTA will execute a full funding grant agreement (FFGA) for the SFIA extension, consistent with MTC Resolution No. 1876. MTC has allocated $301 million in New Rail Starts funds for the BART–San Francisco Airport Extension, which are available for FTA to commit to the project. The balance of the federal funding for the SFIA extension, currently estimated at $449 million, would be provided by FTA through a contingent commitment under Section 3032(g)(2), which designates unobligated funds in the Mass Transit Account of the Highway Trust Fund to complete federal funding.

The FTA has contributed $55.5 million to the project to date, in the form of a $22.5 million grant in 1993 for preliminary engineering and final environmental work, and a $33 million amendment to the grant, in 1995, to perform advanced preliminary engineering and prepare the design/build documents.

SFIA Funding for the Project

SFIA has committed to provide up to $200 million toward the cost of the BART–San Francisco Airport Extension. SFIA's contribution would be used only for eligible on-airport costs. SFIA's commitment is

made in recognition of the contribution the BART extension would make to reducing future highway traffic associated with the projected 70 percent increase in air passengers at SFIA between 1990 and 2006 and with the corresponding increase in SFIA employee trips.

SamTrans Funding for the Project

In March 1990, BART and SamTrans executed a Comprehensive Agreement, through which SamTrans committed to pay 25 percent of all FTA-eligible expenses on BART's Colma and SFIA extensions. In the 1992 Alternatives Analysis/DEIS/DEIR, this 25 percent contribution was estimated to be $197 million.

This commitment has been maintained, and proposed amendments to the Comprehensive Agreement will cap SamTrans' payment at $197 million dollars.

SamTrans' contribution would consist of a $99 million direct contribution to the SFIA Extension and a $98 million contribution to BART's East Bay extension program, which is tied to $98 million in state funds being made available to the BART–San Francisco Airport Extension.

In April 1995, the SamTrans Board of Directors approved a resolution adopting Alternative VI as the LPA for the BART–San Francisco Airport Extension. In November 1995, the SamTrans Board of Directors adopted a new resolution selecting the Aerial Design Option of Alternative VI as the LPA.

The SamTrans board took these actions in conjunction with adopting the principles of a financial plan that would enable SamTrans to continue financial support of its various transportation programs, specifically CalTrain, motor bus, and paratransit/ADA services. The financial plan is an integral part of the SamTrans FY (fiscal year) 1995/96 to FY 2004/05 Short Range Transit Plan.

SamTrans' financial plan requires various actions, including adjustments in the level of motor bus subsidies and amendment of the BART-SamTrans Comprehensive Agreement of 1990. The major elements of the plan are:

1. BART project costs will be paid from unrestricted reserves and from savings accrued by eliminating duplicate and inefficient motor bus services.
    a. $110 million in unrestricted reserves would be used toward a near-term SamTrans contribution of $185 million.
    b. An estimated $75 million in bonds would be issued to provide the balance of the required $185 million.
    c. Bus system modifications would be identified to eliminate redundant and inefficient services through the Comprehensive Route Renovation Study.
2. The BART-SamTrans Comprehensive Agreement will be amended to change SamTrans participation in project costs.
    a. SamTrans' near-term payment to BART would be reduced from $330 million to $185 million.
    b. An absolute cap would be placed on the SamTrans contribution to project construction costs.

c. The remaining $145 million payment to BART would be made from net operating revenues, including fare surcharges once the extension begins operation.

State Funding for the Project

In its 1992 STIP, the California Transportation Commission (CTC) made an overall commitment to BART's Phase I Extensions program of $536 million. To date, BART has received over $330 million of this total, principally for the Colma, Dublin/Pleasanton, and Pittsburg/Antioch extensions. A subset of this $536 million from CTC is a commitment of $277 million in TCI funds, which was made in October 1988. MTC Resolution No. 1876 programmed $98 million of these TCI funds for the BART–San Francisco Airport Extension.

The state has appropriated $19.6 million to the BART extension through December 1995; $9.25 million of this state contribution was used to match the $55.5 million already received in FTA grants. The balance of state funds will be used for future FTA grant local-match requirements.

CTC has recently approved $40 million in near-term STIP funds (in lieu of a portion of the $98 million TCI commitment) and $7 million in additional TCI funds for the BART extension.

In addition to TCI and STIP funding, Proposition 116 funds, which were approved by California voters in June 1990, are also available for the project. This measure called for the sale of nearly $2 billion in general obligation bonds to fund transit improvement projects statewide according to a detailed expenditure plan. This plan includes a $10 million apportionment to SamTrans for BART extensions within San Mateo County. The funds were not required for the BART Colma extension and may therefore be allocated by CTC to the BART extension. The $10 million is currently held in a trust account and is proposed to be distributed to BART in FY 1997.

West Bay Bridge Toll Revenues

MTC collects approximately $7 million annually in tolls from automobiles crossing the San Francisco–Oakland Bay Bridge. These toll revenues are reserved by statute for transit capital improvements in San Francisco, San Mateo and Santa Clara counties. MTC allocates toll revenues according to a policy statement adopted in April 1989 that lists projects in the Resolution No. 1876 New Rail Transit Starts and Extensions Program as the first priority for such funds.

MTC has committed to fund the project with a total of $10 million from West Bay toll revenues. Toll revenues are subject to annual allocation by MTC; $1 million was allocated during FY 1995. The remaining $9 million is expected to be allocated over the next several years. As MTC has given the project high priority funding status, the project proponents consider it very likely that MTC will continue to make its allocations as planned.

Role of the Cities in Funding the Project

The cities of South San Francisco, San Bruno, Millbrae, and Burlingame are not required to pay any portion of the cost of the Aerial Design Option LPA; all project elements will be funded by other agencies. However, some cities have proposed enhancements that are not required by the project nor considered part of the project description. These will remain the responsibility of each city, or entities each city finds to fund them.

Constructing major portions of the Aerial Design Option LPA alignment is done for engineering reasons and is not considered to be an enhancement. Further preliminary engineering has determined that subway construction cannot be avoided from Colma to near San Felipe Avenue in San Bruno, where the alignment rises to grade and to the aerial structure. Because the alignment must go under each of the 21 street intersections along the route, and must be underground through the Colma cemeteries, economies of scale will permit undergrounding lengthy portions of the alignment at no greater cost than if it were constructed in subway for the street intersections and cemeteries, and at-grade construction for the remainder.

Proposed Financing Plan for the Project

Federal funds will be provided to the project in increments, with the amount determined by Congress annually. Other project funds may also be provided incrementally. Thus, it may be necessary to establish interim financing to cover the gap between needed construction capital and the receipt of committed project funds.

The final financing plan for the Aerial Design Option LPA will address these issues and incorporate comments by SamTrans, MTC, and FTA.

6.2 Analysis of Project Effectiveness

This section summarizes the transportation system effectiveness and the cost effectiveness of the Aerial Design Option LPA.

Transportation System Effectiveness

The following summary focuses on the performance of the Aerial Design Option LPA in providing transportation benefits in the year 2010 (see Table 6-2).

Daily BART Entrances and Exists by Station. The Aerial Design Option LPA is estimated to increase daily BART Peninsula trips in San Mateo County (Daly City to the end-of-line station) from 44,800 trips under the TSM assumptions to 98,100.

Daily Boardings. Daily boardings on the entire BART system would increase by 39,600 to 401,400.

Trip Time Comparison. Trip time is estimated for a BART patron going from downtown San Francisco (the intersection of Montgomery and Market Streets) to SFIA terminals. "Trip time" includes time spent arriving at the station, waiting for the train, traveling to the airport, and walking/taking Airport Light Rail System (ALRS) to the various terminals. Trip time is estimated at 44 minutes for the Aerial Design Option LPA, of which 29 minutes is actual travel time on BART.

Regional Transit Trips and Mode Split. The Aerial Design Option LPA would increase daily transit trips in the region by 13,800 in 2010.

Air Passengers on Public Transit. An estimated 7,200 air passengers would use the Aerial Design Option LPA daily to reach the SFIA.

Table 6-2
Transportation Effectiveness
Year 2010

Measure	Alternative I No Build	Aerial Design Option LPA
BART Daily Entrances/ Exits by Station (1)		
Daly City	13,600	13,300
Colma	35,200	16,200
Subtotal	**48,800**	**29,500**
Hickey	-	8,000
Tanforan	-	9,800
International Terminal	-	17,800
Millbrae Avenue	-	33,000
Subtotal	-	**68,600**
TOTAL	**48,800**	**98,100**
Daily Boardings (2)		
BART	359,400	401,400
Change from TSM	(2,400)	39,600
CalTrain	37,800	46,700
SamTrans	88,200	85,400
ALRS	0	6,200
Trip Time from Montgomery and Market Street to SFIA Terminals (Minutes) (3)		
Entire Trip Travel Time on BART	NA	29
Daily Regional Transit Trips (Linked Trips) (4)		
Work Trips	593,200	604,100
Non-Work Trips	678,700	691,000
Total	1,271,900	1,295,100
Change From TSM	(9,600)	13,800
Air Passengers on Public Transit (5)		
BART	-	7,200
CalTrain	200	3,200
Bus	17,700	14,800
Total	17,900	25,200

Table 6-2 (continued)
Transportation Effectiveness
Year 2010

Measure	Alternative I No Build	Aerial Design Option LPA
Transit Utilization and Mode Share Percent by Trip Destination		
To SFIA [6]		
Transit Trips	23,300	33,400
Mode Share Percent	9.8%	14.1%
To Downtown SF from the Peninsula [7]		
Transit Trips	45,600	53,300
Mode Share Percent	34.9%	40.7%
Level of Service [8]		
Number of Intersections at:		
LOS D	6	8
LOS E	8	8
LOS F	0	0

Source: BART Extension Planning, 1996.

Notes:
1) For more information, see Table 3.1-6 of this document, and Table 3.1-7 of the Summary DEIR/SDEIS.
2) For more information, see Table 3.1-5 of this document, and Table 3.1-2 of the Summary DEIR/SDEIS.
3) For more information, see Table 3.1-4 of this document, and Tables 3.1-19 and 3.1-63 of the DEIR/Technical Appendix.
4) For more information, see Table 3.1-7 of this document, and Table 3.1-3 of the Summary DEIR/SDEIS.
5) For more information, see Table 3.1-8 of this document, and Tables 3.1-22 and 3.1-67 of the DEIR/Technical Appendix. "Bus" category includes public transit, shuttles, and private vans.
6) For more information, see Table 3.1-9 of this document, and Table 3.1-6 of the Summary DEIR/SDEIS.
7) For more information, see Tables B-39 and B-7 of the DEIR/Technical Appendix.
8) LOS after mitigation.

Transit Utilization and Mode Share Percent by Trip Destination. The number and percentage of trips made by transit to the SFIA would increase to approximately 14.1 percent, 33,400 under the Aerial Design Option LPA. These figures represent a 43.3 percent increase in transit trips over the No Build Alternative.

Trips to downtown San Francisco by transit are projected to increase from 34.9 percent of all trips under No Build assumptions and 37.0 percent under the TSM Alternative, to 40.7 percent for the Aerial Design Option LPA.

Level of Service at Intersections. Level of service (LOS) indicates the ease with which traffic moves through an intersection at a given moment. LOS categories are defined and discussed in greater detail in the Transportation section of Chapter 3 (Section 3.1) of this FEIR/FEIS.

In 2010, six intersections are projected to be at LOS D under the No Build Alternative, and seven under the TSM Alternative after mitigation. The Aerial Design Option LPA would result in eight intersections at LOS D. Eight intersections would be at LOS E under the No Build Alternative or the Aerial Design Option LPA. No intersections are projected to be at LOS F under any alternative.

Cost Effectiveness

FTA has established a formula for calculating the cost effectiveness of a new fixed guideway project or an extension of an existing fixed guideway system. This cost-effective index (CEI) provides a means of comparing the transportation benefits of each proposed alternative with its respective costs. The CEI is a relative measure, based upon calculated changes in cost per new transit rider compared to the TSM Alternative. Thus, FTA does not set a fixed national CEI standard that a project must achieve, and the CEI is one of many factors considered by FTA in evaluating a proposed project alternative.

As shown in Table 6-3, the CEI for the Aerial Design Option LPA was calculated as $26.12. CEI's for other proposed alternatives shown in the DEIR/DEIS and FRDEIR/S#2DEIS were calculated using FTA's CEI assumptions in effect prior to October 1995. Thus, for consistency and to provide a common basis for comparison, the CEI for the Aerial Design Option LPA was also calculated using FTA's assumptions in effect prior to October 1995.

Table 6-3
Cost-Effectiveness Index
Millions of 1996 Dollars
Annual Trips and Travel Time Savings for 2010

ALTERNATIVE	Annualized Capital Costs [1]	Change from TSM [2]	Annual O&M Costs [3]	Change from TSM [4]	Annual Travel Time Savings [5]	Annual Transit Trips [6]	Change from TSM [7]	Cost-Effectiveness Index [8]
Alternative II TSM	$19.90	NA	$632.59	NA	NA	391.37	NA	NA
Aerial Design Option LPA	$104.09	$84.19	$662.07	$29.48	$6.87	395.46	4.09	$26.12

Source: BART West Bay Extensions, 1996.

Notes: Cost-Effectiveness Index (CEI) = ([2] + [4] - [5]) / [7] = [8]
This CEI calculation uses the FTA assumptions in effect prior to October 1995. Using the FTA's new assumptions, the CEI for the Aerial Design Option would be $19.76.
NA = Not applicable.

Chapter 7
Environmental Justice

7.1 Introduction

This section addresses Executive Order No. 12898 of February 11, 1994 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"). The order provides, in pertinent part:

> To the greatest extent practicable and permitted by law ... each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations ... . (Subsection 1-101).
>
> Each Federal agency shall conduct its programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under, such programs, policies, and activities, because of their race, color, or national origin. (Subsection 2-2).
>
> Each Federal agency shall work to ensure that public documents, notices, and hearings relating to human health or the environment are concise, understandable, and readily accessible to the public. (Subsection 5-5[c]).

A Presidential Memorandum that accompanied the executive order emphasized that the order was "intended to promote nondiscrimination in Federal programs substantially affecting human health and the environment, and to provide minority communities and low-income communities access to public information on, and an opportunity for public participation in, matters relating to human health or the environment" (*Weekly Compilation of Presidential Documents*, February 11, 1994). It also underscored the application of certain provisions of existing law, such as National Environmental Policy Act (NEPA). Specifically, the memorandum notes that a NEPA analysis must include "effects on minority communities and low-income communities" and that mitigation measures "should address significant and adverse environmental effects of proposed Federal actions on minority communities and low-income communities" (Subsection 5-5c). In addition, "[e]ach Federal agency shall provide opportunities for community input in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of meetings, crucial documents and notices" (Subsection 5-5c).

Thus, the memorandum encourages, wherever possible, the use of existing requirements and procedures to accomplish the goals of the executive order. Accordingly, this section uses the NEPA/California Environmental Quality Act (CEQA) framework to assess whether the project meets the goals and requirements of the order and memorandum. This section first discusses whether the project meets community participation goals and then analyzes impacts on minority and low-income communities.

7.2 Community Participation

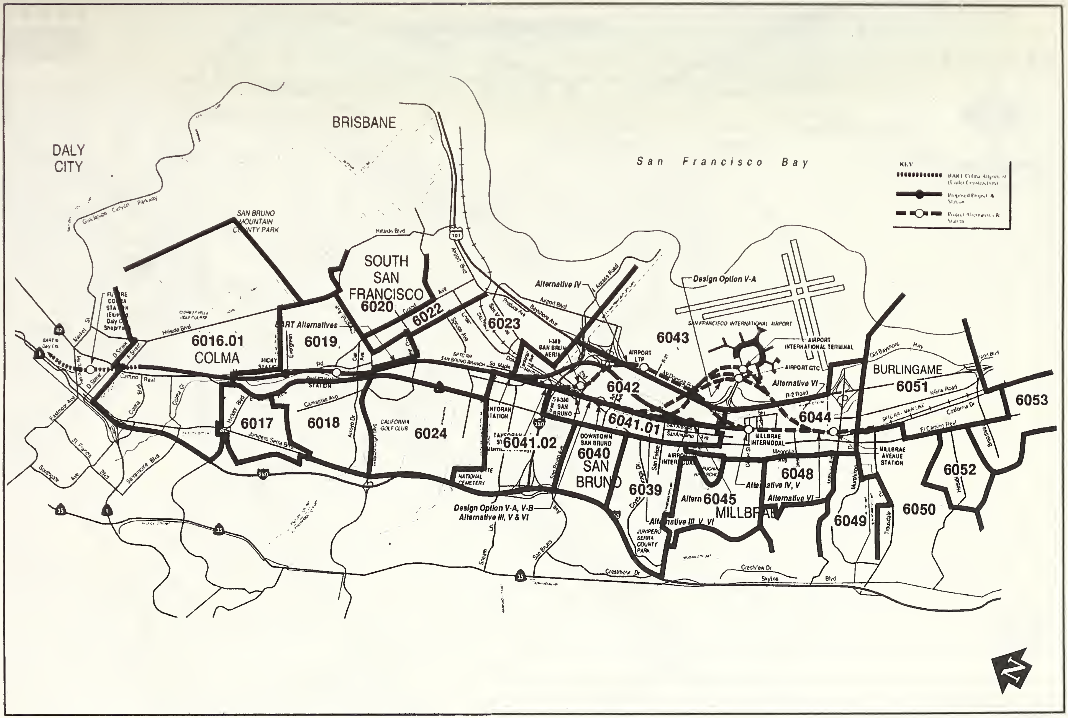
As discussed in Chapter 8, extensive community access to information and opportunities to participate have been provided throughout the project formulation, planning, selection, and development processes. Formal opportunities for public involvement were initially presented during scoping and during the environmental document preparation transition. In addition, written comments on the DEIR/SDEIS were accepted during the public comment period from January 13 to March 14, 1995; additionally, a public hearing was held during this comment period. After this comment period, the public had additional opportunities to comment during advisory/steering committee meetings to recommend a preferred alternative to the BART and SamTrans boards and at the BART and SamTrans board meetings for the selection of a preferred alternative. Subsequently, an additional public comment period and public hearing was held for the Final Revised Draft Environmental Impact Report/Supplemental #2 Supplemental Draft Environmental Impact Statement (FRDEIR/S#2SDEIS) in Fall 1995, the purpose of which was to evaluate environmental effects of the aerial option to Alternative VI. Community comments were solicited at the BART and SamTrans hearings to select an LPA in November 1995. After publication of this FEIR/FEIS, the public will have an opportunity to attend BART and SamTrans board meetings to certify a FEIR/EIS and adopt a project.

In addition, an extensive public involvement campaign has been undertaken throughout the formulation and development of the project. Following the initial scoping meeting, months of outreach were conducted at the public, city staff, and elected official levels with the communities of Colma, South San Francisco, San Bruno, Millbrae, and Burlingame. The communities were informed of the project status through meeting notices, newsprint media, a project newsletter, fact sheets, an Open House Month (June 1994), and a local project hotline. Public presentations were given to community coalitions, citizen advisory committees, local school districts, civic organizations, public works coordinators, city managers, mayors and other elected officials, and state and federal resource agencies.

Additional community participation opportunities will be provided throughout the remainder of the project. Communities will continue to receive project information through large mailings, and the public can visit the Community Information Center in San Bruno to obtain day-to-day project status information. All members of the public will have a continuing opportunity to make their views known through the project hotline, other phone contacts, and correspondence.

7.3 Impact Analysis

The Executive Order and Presidential Memorandum require consideration of the impacts on minority and low-income "populations" and "communities," but do not define these terms. For the purposes of this analysis, geographical "neighborhoods" are assumed to be representative of "populations" and "communities." This section determines whether the relevant neighborhoods, as delineated in Chapter 3, Section 2 (Land Use) of this document (Figures 7-2, 7-3, 7-4, and 7-5), are "high minority" or "low income" according to demographic information from the U.S. Census Bureau (Figure 7-1; Table 7-1). This section then sets forth the possible unmitigable impacts to these neighborhoods (Table 7-2), as identified in Chapter 3 (Environmental Analysis). Each of the alternatives is then assessed separately to determine whether its significant, unmitigable impacts on high-minority or low-income neighborhoods



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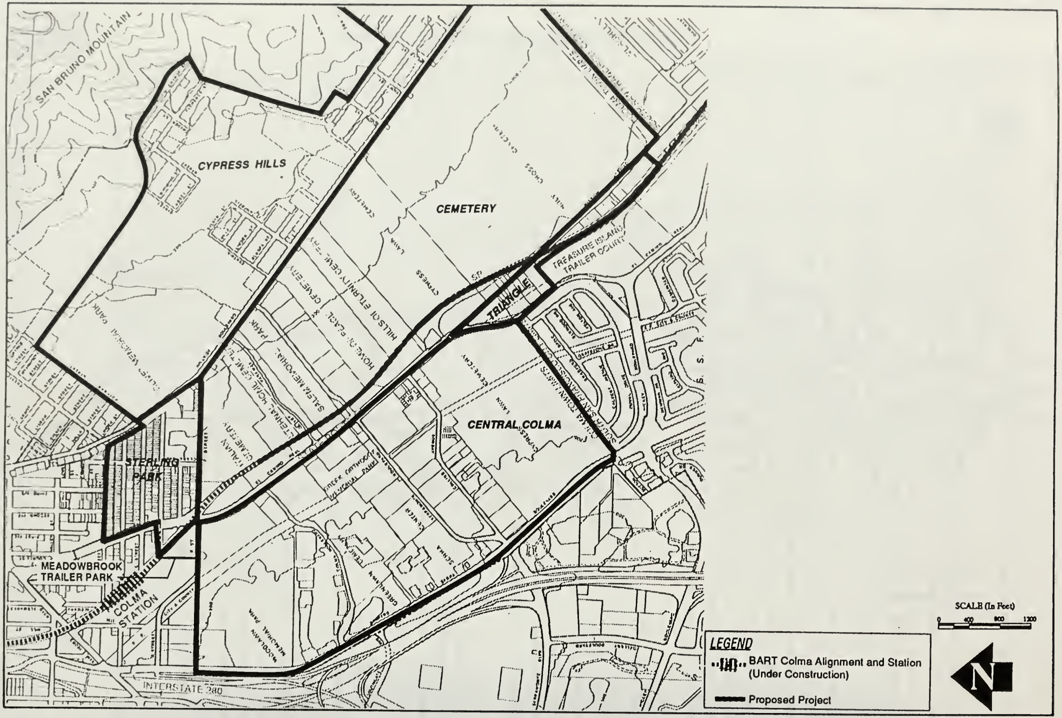
Census Tracts in the Project Corridor

FIGURE 7-1



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Colma Neighborhoods

FIGURE 7-2

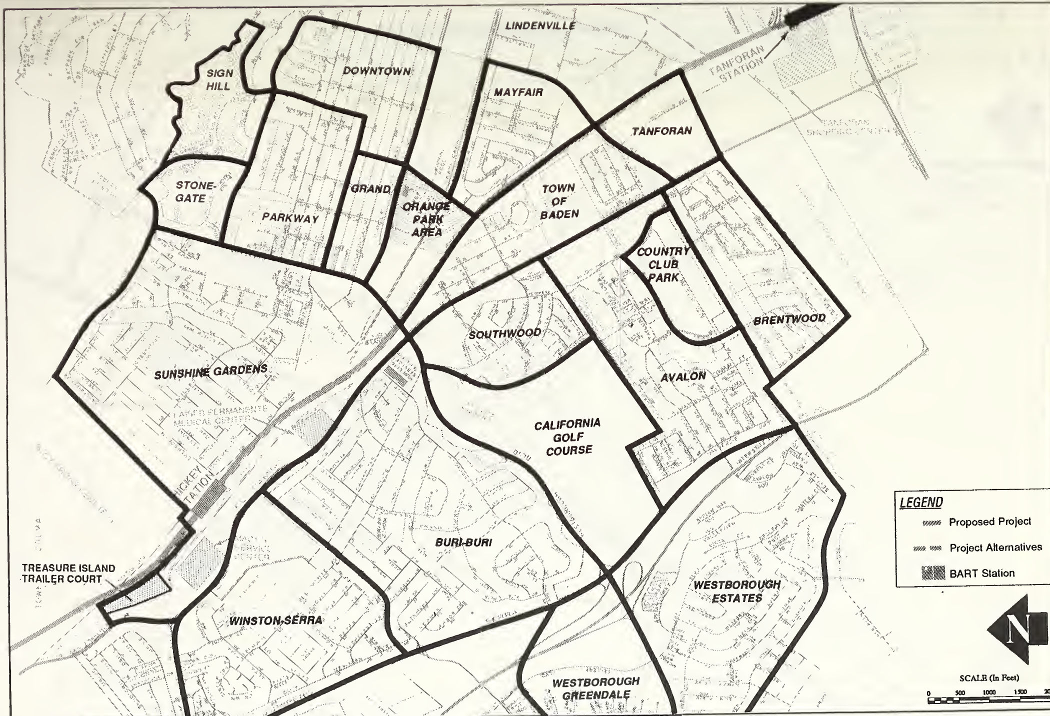

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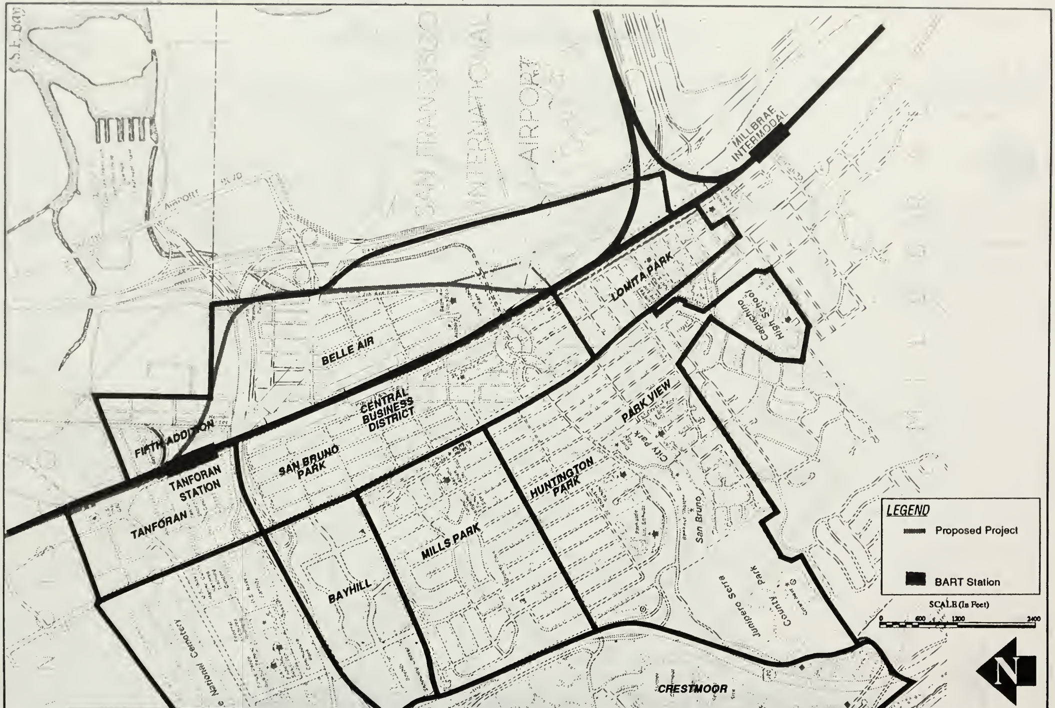
FIGURE 7-3

South San Francisco Neighborhoods



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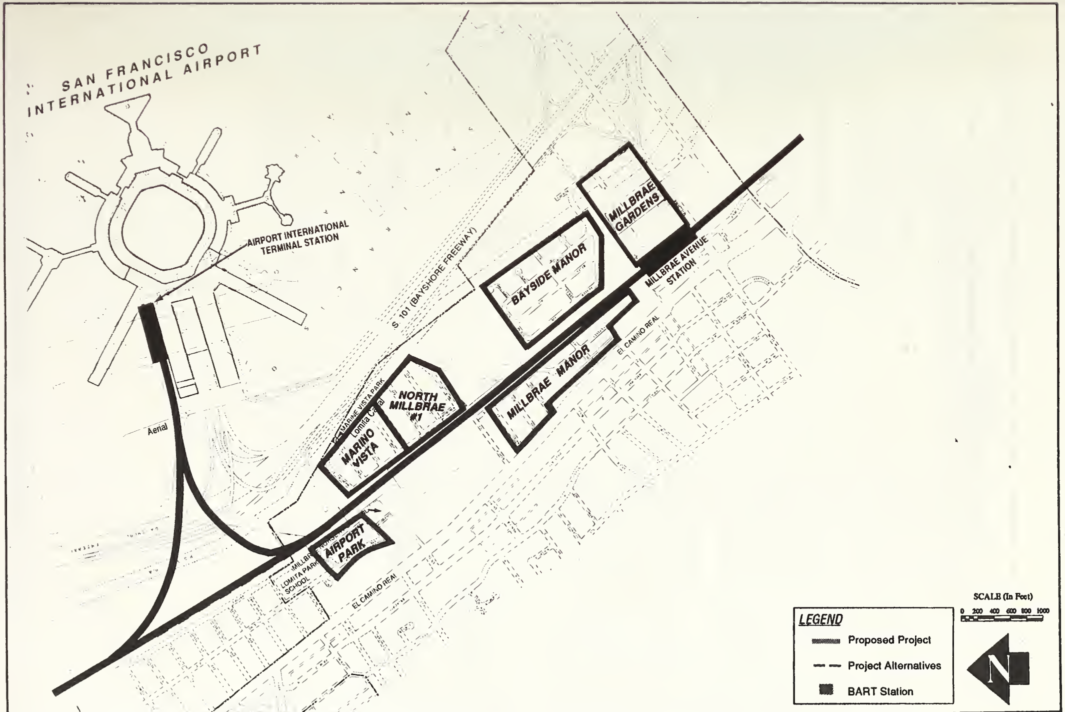
San Bruno Neighborhoods

FIGURE

7-4



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Millbrae Neighborhoods

FIGURE 7-5

Table 7-1
Summary of Residential Displacements and Significant Unmitigable Operational Impacts on Neighborhoods

Meadowbrook	Visual
Treasure Island	——
Sunshine Gardens	Cohesion D=2
Town of Baden	——
Mayfair	——
Fifth Addition	——
San Bruno Park	——
Belle Air	——
Lomita Park	——
Airport Park	——
Marino Vista	Visual
North Millbrae	——
Millbrae Manor	D=2
Bayside Manor	D=2 Visual
Millbrae Gardens	Cohesion D=202
Total Displacements	208

Notes:

"D" represents number of residential units displaced.
"Cohesion" impacts refer to the disruption of social patterns of shopping, circulation, and neighborhood activities.

Table 7-2
Summary of Possible Significant Unmitigable Construction Impacts on Neighborhoods

Meadowbrook	Visual Noise and vibration
Treasure Island	Visual Noise and vibration
Sunshine Gardens	Disruption of local circulation Visual Noise and vibration
Town of Baden	Disruption of local circulation Noise and vibration
Mayfair	Disruption of local circulation Noise and vibration
Fifth Addition	Disruption of local circulation Visual Noise and vibration
San Bruno Park	Disruption of local circulation Disruption to businesses Visual, noise and vibration
Belle Air	Loss of community garden (1) Access to businesses Disruption of local circulation Visual Noise and vibration
Lomita Park	Visual
Airport Park	Visual
Marino Vista	Visual
North Millbrae	——
Millbrae Manor	——
Bayside Manor	Noise and vibration
Millbrae Gardens	——

Notes:
1) Temporary loss of community garden if laydown yard Alternative A is selected.

"Disruption to businesses" is a construction impact that involves partial lane closures and results in inconvenience to a neighborhood.
"Visual" impacts include streetscape effects, proximity to sensitive receptors, and loss of significant views or scenic resources.

are "disproportionate" to its significant, unmitigable impacts on other neighborhoods within the project corridor.[1] The determination of significant, unmitigable impacts is presented in Chapter 3, Environmental Analysis, of this volume. The significance criteria and methodology for assessing impacts are detailed, as well as mitigation measures to reduce the impacts to an insignificant level. Where such measures are insufficient to reduce the effects to an insignificant level, the impact is classified significant and unavoidable, or unmitigable.

The environmental justice analysis requires a balancing of impacts resulting from each alternative/design option on each neighborhood. This comparison considers the effects of each alternatives/design options as a whole.

Of the 15 neighborhoods located within the project corridor from Colma to Millbrae, three of the neighborhoods can be defined as "high-minority" neighborhoods: Town of Baden (65 percent minority), Fifth Addition (67 percent minority), and Millbrae Gardens (71 percent minority). The remaining neighborhoods are referred to as "mixed-populace" neighborhoods. All neighborhoods in the project corridor, except the Fifth Addition, are considered low-income neighborhoods.

To take qualitative differences into consideration, this section distinguishes among three categories of impacts:

- residential relocation impacts which includes related socio-economic impacts,
- significant, unmitigable, non-relocation operational impacts (referred to as "operational impacts," and
- significant, unmitigable construction impacts.

Relocation impacts are accorded the most weight; other operational impacts are assigned somewhat less importance; and construction impacts are considered the least significant, due to their relatively short duration. Preliminary findings indicate that there are sufficient resources in the communities in which the displacement would take place or in the adjacent communities to house those residents who would be displaced, i.e., Daly City, South San Francisco, San Bruno, and Redwood City. BART/SamTrans will attempt to relocate households within a reasonable distance of their original neighborhoods.

During preliminary engineering, Housing Valuation Studies will be performed for any residential relocation and will consider the type and availability of replacement housing. The studies will determine whether rental differential or purchase differential payments are necessary. These payments are not taxable and are based on studies of comparable "equal to or better than" replacement dwellings. All potential replacement dwellings will be determined to be "decent, safe and sanitary" before consideration. A displacee may move or relocate up to 50 miles from their original location and be eligible for relocation assistance benefits. Payments will be made as lump sums once all administrative steps are complete.

Impact Analysis by Neighborhood

The following discussion identifies the neighborhoods that would incur significant, unmitigable impacts from the Aerial Design Option LPA. As shown in Table 7-1, the Aerial Design Option LPA would result in 208 residential displacements. The Aerial Design Option LPA would result in significant, unmitigable

[1] The word "disproportionate" in the Executive Order and Presidential Memorandum is not defined and could be subject to various interpretations. For example, "disproportionate" could refer to the impacts of one particular alternative when compared to another alternative. For the purposes of this analysis, "disproportionate" refers to the proportion the impacts of a particular alternative that affect high-minority and low-income neighborhoods as compared to the proportion that affect other neighborhoods in the project corridor.

impacts in four neighborhoods. The Aerial Design Option LPA would impose significant, unmitigable construction impacts (temporary) on 12 neighborhoods.

Colma Neighborhoods. The only neighborhood in Colma that would be affected by the Aerial Design Option LPA is the Meadowbrook area. Operational impacts are limited to visual impacts, and construction impacts may consist of visual and noise/vibration impacts.

South San Francisco Neighborhoods. Treasure Island would not experience operational impacts from the Aerial Design Option LPA. Construction impacts may involve visual and noise/vibration impacts.

Sunshine Gardens would experience the displacement of two units and disruption of community cohesion from the Aerial Design Option LPA. Construction impacts may include disruption of local circulation, visual, and noise/vibration effects.

The Town of Baden is not expected to have operational impacts from the Aerial Design Option LPA. Disruption of local circulation and noise/vibration impacts may be experienced during construction.

Mayfair would not experience operational impacts from the Aerial Design Option LPA. Construction impacts may include disruption of local circulation and noise/vibration.

San Bruno Neighborhoods. Fifth Addition residences would not experience impacts associated with operation of the Aerial Design Option LPA. Construction impacts may include disruption of local circulation, overall disruption of neighborhood quality, visual, and noise/vibration impacts.

San Bruno Park residents would not experience operational impacts from the Aerial Design Option LPA. Construction impacts may include restricted access to businesses, disruption of local circulation, visual, and noise/vibration impacts.

The Belle Air neighborhood would not have operational impacts from the Aerial Design Option LPA. Laydown area Alternative A would require temporary use of the community garden. Construction impacts may also include disruption of local circulation, reduced access to businesses, visual, and noise/vibration.

Lomita Park would not experience operational impacts from the Aerial Design Option LPA. Construction may result in visual impacts.

Millbrae Neighborhoods. Airport Park would not experience operational impacts from the Aerial Design Option LPA but would experience construction-related visual impacts.

Marino Vista would experience visual impacts from both operation and construction of the Aerial Design Option LPA. No operational or construction-period impacts would be expected for the North Millbrae neighborhood.

The operational impact of the Aerial Design Option LPA would be the displacement of two Millbrae Manor residential units.

Bayside Manor would experience the displacement of two residential units and visual impacts from operation of the Aerial Design Option LPA. Construction impacts consist of noise and vibration.

Millbrae Gardens would experience the displacement of all 202 residential units in the neighborhood and a loss of community cohesion under the Aerial Design Option LPA. No construction-related impacts are expected.

Impact Analysis by Alternative

Minority Neighborhoods. The Aerial Design Option LPA would require relocating 208 households, in four neighborhoods, only one of which is a high-minority neighborhood: the mixed-populace neighborhoods of Sunshine Gardens (two units), Millbrae Manor (two units), and Bayside Manor (two units); and the high-minority Millbrae Gardens (202 units). Operational impacts may occur in four neighborhoods, only one of which is high minority: the mixed-populace neighborhoods of Meadowbrook, Sunshine Gardens, Marino Vista; and the high-minority Millbrae Gardens. Construction would cause impacts in 12 neighborhoods, two of them high minority.

It appears that the Aerial Design Option LPA may cause a disproportionate impact to high-minority neighborhoods because 97 percent of the displacements would occur in one high-minority neighborhood. This would appear to outweigh the fact that 75 percent of the neighborhoods bearing operational impacts, and 83 percent of those incurring construction impacts, would be mixed-populace neighborhoods.

Low-Income Neighborhoods. The Aerial Design Option LPA would require relocating approximately 208 residential units, all of which are in low-income neighborhoods. Operational impacts would occur in four neighborhoods, all of which are low income. Construction would impact 12 neighborhoods, 11 of which are considered low income. Consequently, the Aerial Design Option LPA may have disproportionate impacts on low-income neighborhoods.

7.4 CONCLUSION

As discussed above, the Aerial Design Option LPA may result in disproportionate impacts on high-minority neighborhoods. The Aerial Design Option LPA may also disproportionately impact low-income communities.

With respect to high-minority and low-income communities, Executive Order No. 12898 requires that "[t]o the extent practicable" such impact shall be "identif[ied] and address[ed], as appropriate...." All of the impacts discussed in this section are unmitigable and these impacts have been appropriately addressed by identifying and analyzing a reasonable range of alternatives (see Chapter 2). Within the reasonable range of alternatives, only the No Build Alternative would not impose disproportionate impacts on low-income communities in the study area.[2]

[2] This analysis does not take feasibility considerations into account. The build alternatives analyzed in this document have been shown, through an extensive public process, to be the only feasible build alternatives that satisfy project objectives.

Chapter 8
Community Participation

8.1 Introduction

Community and agency participation and outreach is an important element in the environmental process. Key aspects of the program include a comprehensive scoping process, and early consultation and coordination with the public and agencies. When requested by participating cities, forums are held to receive public and agency input. A mailing list is maintained of individuals and organizations interested in the ongoing progress of the BART–San Francisco Airport Extension.

8.2 Summary of Prior Community Involvement

In preparing the Alternatives Analysis Draft Environmental Impact Report/Draft Environmental Impact Statement (AA/DEIR/DEIS), the Metropolitan Transportation Commission (MTC) implemented a Citizen Participation Program to establish a channel of communication with interested parties. The program was intended to provide general and technical information about the AA/DEIS/DEIR and the project alternatives to interested groups, public agencies, and individuals within the project corridor. To that end, a comprehensive mailing list was created to maintain communications.

To disseminate information on the study progress, the project alternatives, and the analysis being performed, MTC distributed newsletters and held community workshops and open-houses. Formal public hearings were held to provide the public with an opportunity to comment on the merits of the alternatives, as well as the environmental analysis contained in the AA/DEIS/DEIR. Other components of MTC's participation program centered around following coordination activities:

- **Policy Committee.** This committee was designated to oversee the study as it progressed toward the determination of the Locally Preferred Alternative (LPA). It consisted of five members of the MTC Commission, three BART directors, and three SamTrans directors.
- **Technical Advisory Committee.** The Technical Advisory Committee (TAC), composed of local government staff with technical backgrounds, provided input on local issues, including responses to technical issues raised by the public.
- **Local Government.** In addition to the TAC, coordination and briefings on project alternatives and community-specific issues were conducted with local staff and officials of the affected communities.
- **Citizen Advisory Committee.** Four Citizen Advisory Committees were formed, one for each city in the project corridor. Members, appointed by the respective city councils, provided input to the project team and the TAC on community issues to be addressed in the environmental document and in project design.

Since July 1992, BART and SamTrans have assumed, from MTC, primary responsibility for the environmental and engineering processes. BART and SamTrans will act as the primary agencies with respect to project decision-making and implementation. As a result, elements of MTC's Citizen Participation Program have been modified. The current public participation efforts are described below.

8.3 Scoping for the DEIR/SDEIS

Written public comments, pertinent to the scope and content of the environmental information and alternatives included in the Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (DEIR/SDEIS), were accepted from June 15 to July 16, 1993. On Thursday, July 8, 1993, BART and SamTrans hosted a public scoping meeting for the proposed BART–San Francisco Airport Extension DEIR/SDEIS. The scoping meeting was held to solicit public input on the proposed alternatives and their environmental impacts. The scoping meeting was held at the South San Francisco Conference Center, 255 South Airport Boulevard, in South San Francisco. This site was selected because of its central location within the project corridor. The facility offered an "all-in-one" service which included the room, seating/tables, audio/visual equipment, accessible parking, phones/restrooms, and an onsite staff. The facility was accessible to disabled individuals and located directly on the #7B SamTrans bus line.

A public open-house from 6:30 P.M. to 7:30 P.M. was held before the regular meeting to allow the public to review maps of the various alignments and to ask questions of staff regarding project design and environmental impacts. The formal public meeting began at 7:30 P.M. with a presentation by BART and SamTrans staff on the project alternatives, preliminary environmental impacts, and the environmental review process. The public was then invited to offer comments on the alternatives, other alternatives they had formulated, and areas of concern to be addressed in the DEIR/SDEIS. The meeting concluded at 9:25 P.M.

Prior to the meeting, a project newsletter was mailed to over 4,000 people, drawn from MTC's mailing list as well as lists of individuals who had expressed an interest in being kept informed, to invite them to attend the public scoping meeting and provide background information to educate the public. Public meeting notices were placed in the San Mateo Times and San Francisco Chronicle/Examiner papers on the Sunday and Wednesday prior to the public meeting. Large (11x17-inch) meeting notice postings were placed along the proposed project alignment and surrounding areas at SamTrans bus shelters. A press release was sent out via two wire services to numerous local papers, a number of papers read by minority populations along the corridor, and several chambers of commerce and city hall newsletters. The California Relay Service was notified to provide meeting information to hearing and visually impaired individuals.

A total of 182 people signed the attendance sheets at the entrance of the meeting. A total of 32 people filled out the public comment card that was made available for people who wanted to either speak at the meeting or offer written comments. Eleven comment cards contained handwritten comments (including comments from three of the speakers). Written letters were received from

regional agencies (2), state agencies (6), local agencies (7), private special-interest organizations (8), and individuals (20).

BART and SamTrans planning and engineering staff were also available following the meeting to answer questions about the proposed project and other alignment alternatives. Written project materials were provided to all attendees. Handouts included a scoping packet, newsletter, and project schedule.

8.4 Selection of the Locally Preferred Alternative

On January 13, 1995, BART, SamTrans, and the Federal Transit Administration (FTA) released the BART–San Francisco Airport Extension DEIR/SDEIS for a 60-day public comment period. The DEIR/SDEIS was circulated to approximately 440 agencies, organizations, and individuals and was made available at all libraries and city halls within the project corridor. One hundred and fifty persons testified at public hearings, held February 15, February 18, and March 14, 1995 to collect comments on the DEIR/SDEIS. By the conclusion of the public comment period on March 14, 1995, 298 agencies, organizations, and individuals had submitted written comments on the DEIR/SDEIS. In total, approximately 3,000 discrete written and verbal comments were received.

Based on public comment on the DEIR/SDEIS and considerations of transit ridership, service to the SFIA, and environmental impacts, the BART and SamTrans Boards of Directors on April 27 and 28, 1995 selected Alternative VI–BART to Millbrae via the planned Airport International Terminal as the new LPA. This decision defined Alternative VI as the local recommendation for more detailed engineering and final environmental documentation.

Following the decision by the BART and SamTrans boards, a Focused Recirculated Draft Environmental Impact Report/Supplemental #2 Draft Environmental Impact Statement (FRDEIR/S#2DEIS) was prepared to consider other options of bringing BART service into the San Francisco International Airport (SFIA). The FRDEIR/S#2DEIS evaluated the Aerial Design Option to Alternative VI. Because the aerial segment replaced only a portion of Alternative VI, the environmental analysis focused only on the segment of Alternative VI south of Angus Avenue in San Bruno to the end of the tailtracks in Burlingame.

The Millbrae Avenue Station plan was reevaluated in the FRDEIR/S#2DEIS to incorporate certain elements of the Millbrae Avenue Station Concept Plan, published February 13, 1995 and adopted by the Millbrae City Council in Resolution 95-20. Reexamination of the Millbrae Avenue Station design also responds to SamTrans Resolution No. 1995-45, which in part resolved to facilitate cross-platform transfers between BART and CalTrain at the Millbrae Avenue Station.

A 45-day public comment period and one public hearing for the FRDEIR/S#2DEIS followed publication of the document in September 1995. The BART and SamTrans boards considered modifying of the Alternative VI LPA following consideration of: 1) public comments, 2) FRDEIR/S#2DEIS conclusions, 3) written and oral comment on that document, and 4) additional engineering and financial data. The boards subsequently adopted the Aerial Design Option as the new LPA on November 28 and 29, 1995.

In modifying a segment of Alternative VI as the LPA to incorporate an aerial design option, the BART and SamTrans boards adopted resolutions directing staff to continue to work closely with the local communities to evaluate proposed mitigation. BART will also continue coordination with SamTrans and the local communities to provide appropriate connections between BART and CalTrain, and with the SFIA to coordinate effective integration of the BART extension into the airport facility. BART will also work closely with SamTrans to develop a feasible bikeway along the alignment.

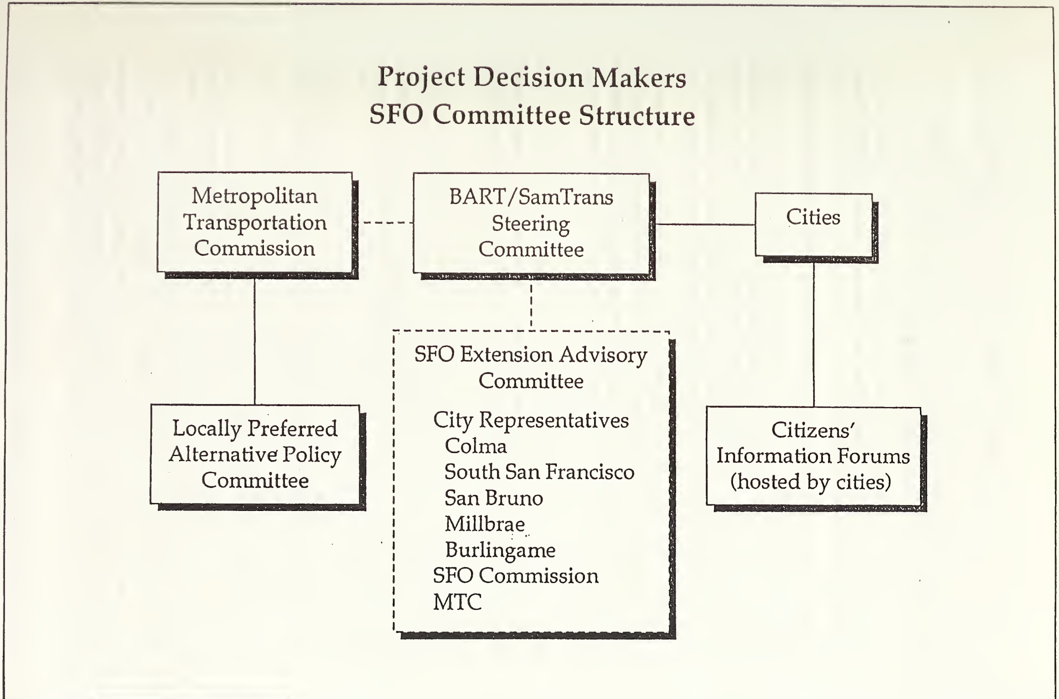
8.5 Continuing Public Participation Efforts

Citizen involvement is an ongoing process of providing information to residents, businesses, local agencies, and the media as the project progresses. At the outset of the DEIR/SDEIS study, the MTC process for public and agency involvement was revised to integrate city participation more fully. Certain elements from the previous MTC Citizen Participation Program, such as working with local government staff and elected officials, required additional emphasis in order to be more responsive to issues raised by the local jurisdictions and to provide more individual attention. As a result, BART expanded consultation with the individual cities. The formation of Citizen Advisory Committees was delegated to the cities in order to provide closer communication between these two groups. An organizational chart of the committee structure (Figure 8-1) shows how the communication functions.

The key functions/responsibilities of the SFO Committee Structure are as follows:

- The BART board, represented by the SFO Liaison Group, meets as a "Steering Committee" with equal SamTrans representation. The BART SFO Liaison Group currently consists of Directors Bianco (Chair), Bernick, Fang, and Pryor. The SamTrans Liaison Group currently consists of Directors Teglia (Chair), Nevin, Huening, and Asmus.
- SFO Extension Advisory Committee (advisory to BART/SamTrans) meets at the invitation of the Steering Committee. This group is made up of local decision-makers: one representative and one alternate from each city, the San Francisco Airports Commission, and MTC. BART, with assistance from SamTrans, staffs the Advisory Committee; information and recommendations flow directly to the Steering Committee.
- The LPA Policy Committee met regularly during the AA/DEIS/DEIR preparation and LPA selection; MTC is responsible for convening and supporting this committee.
- BART, assisted by SamTrans staff, works directly with each city on all issues; responsibility for identifying alternative funding sources resides with the cities. BART and SamTrans will provide assistance to cities when requested. BART is not sponsoring a Citizen Advisory Committee as was done during the AA/DEIS/DEIR; however, BART staff does provide public information presentations when a city wishes to sponsor its own.

Following the public scoping meeting in July 1993, BART and SamTrans staff subjected all proposed and suggested alternatives to an engineering and planning screening process. The results of that process were reviewed by the cities and the Advisory Committee for their input and comments. At a



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SFO Committee Structure

FIGURE 8-1

meeting on August 20, 1993, the Steering Committee concurred with the screening study's recommendations to retain or reject alternatives for consideration in the DEIR/SDEIS.

Following the August 1993 Steering Committee meeting, some very important developments took place regarding the proposed BART–San Francisco Airport Extension:

- In December 1993, San Francisco Airports Commissioner, Michael S. Strunsky, made a formal proposal to the Airports Commission to include an internal airport BART station at the planned Airport International Terminal.
- On February 8, 1994, the San Bruno City Council passed a 3-2 vote to support the study of a Tanforan intermodal station.
- On February 22, 1994, the Millbrae City Council passed a resolution urging the Steering Committee to include an additional alternative in the DEIR/SDEIS involving an internal San Francisco airport station with a terminus station at Millbrae Avenue, and to exclude from continued study any alternative involving a terminus station at Center Street in Millbrae.
- On March 15, 1994, the Advisory Committee convened to hear staff recommendations to include the Millbrae City Council recommendation in the DEIR/SDEIS. A Steering Committee meeting followed on the same day, and the committee voted to include an additional alternative, Alternative VI, in the DEIR/SDEIS, that would incorporate the above recommendations.
- On June 22, 1995, a community forum was held for the Millbrae neighborhoods east of El Camino Real as part of a series of forums conducted by the Millbrae City Council. BART staff described the need for the Alternative VI Aerial Design Option and stated that additional environmental documentation would be prepared and released for public review.
- On December 14, 1995, at the request of citizens from the City of Millbrae's Millbrae Garden neighborhood and with the concurrence of City of Millbrae staff, an informational meeting was held in the City of Millbrae Council Chambers with residents of Millbrae Gardens, Garden Lane Apartments. BART staff described BART's relocation assistance program and addressed questions from residents.
- On February 8, 1996, at the request of citizens from the City of Burlingame, a meeting was held in the City of Burlingame with Burlingame residents. BART staff described the proposed tailtrack in Burlingame and addressed questions from residents.

Public outreach with the cities continues through the following activities listed below.

Public Presentations. All public presentations have been initiated by outside parties, including individual cities, local agencies, local civic organizations, local community coalitions, committees, commissions, and advisory groups. BART and SamTrans staff have tailored presentations to meet the needs of each specific audience. Each presentation includes a brief history of the BART–San Francisco Airport Extension project followed by a detailed description of the alignment alternatives under consideration. Topics covered during public presentations have included funding, real estate issues, project schedule, intermodal connections with CalTrain, and ridership projections.

Graphics illustrations may be utilized. Project literature is distributed to all who attend public presentations.

Public Hearings. BART and SamTrans held public and agency hearings on the DEIR/SDEIS and FRDEIR/S#2DEIS during the public review periods to solicit comments from the public and local, state, and federal agencies regarding the analysis of potential environmental effects and mitigations related to the implementation of a BART extension. After the public review and comment periods, BART and SamTrans board meetings were held to consider selecting a preferred alternative. The public and agencies were provided an opportunity to make comments and state a preference for a preferred alternative at those board meetings.

Public Open-House Events. Three open-house events were coordinated and implemented by the BART and SamTrans project team. The three evening events, held on June 15, 23 and 29, 1994, were co-hosted by Millbrae, South San Francisco, and San Bruno. The events were designed to provide the public with an opportunity to meet with BART and SamTrans project staff and to learn more about the proposed alternatives under consideration in the DEIR/SDEIS.

Promotion of each open-house event was handled by the hosting parties. BART and SamTrans designed and distributed an invitation flyer to approximately 4,000 individuals on the BART–San Francisco Airport Extension project mailing list. BART developed 4x4-inch advertisements for publication in local papers, and each city was responsible for placing their advertisement. BART distributed press releases through a local wire service prior to each open-house event. Approximately four local media representatives (radio and newsprint) covered the event.

Each of the three cities identified a central location to hold their event. The events were held at a local school auditorium (Millbrae), a civic center site (South San Francisco), and a senior recreation center (San Bruno). Each open-house event was set up in a circular formation allowing people to enter, sign in, and browse in a sequential fashion. Graphics were placed on easels for easy viewing. BART and SamTrans staff were located around the room to answer questions about the seven alternatives and design options under study in the DEIR/SDEIS. The open-house events allowed for one-on-one interaction between staff and community members and helped BART and SamTrans to understand many local issues and concerns within the individual communities. "Easy to read" project literature was developed to accompany the open-house graphics and educate the general public about the various project options. The three events attracted approximately 240 people, including property owners, business owners, employees, tenants, and commuters. Following the event, a summary report was compiled to identify the key issues raised by the communities. The following issues were raised at all three events: schedule, real estate (acquisition, relocation, and benefits), engineering and design, station locations, convenience, crime and safety, funding, construction impacts, economic development impacts and opportunities, community input, and overflow parking.

Community Service Center. The BART Community Service Center, located in the Tanforan Park Shopping Center, is open to the public Tuesday through Friday from 10:00 A.M. until 6:00 P.M.

Public Information Hotline. A toll-free hotline (415) 398-2002 has been in operation since the Public Scoping meeting in July 1993. Approximately 25 calls are received on a weekly basis, and a BART staff person responds to each call within a 24-hour period. The hotline is in operation

weekdays between 8:15 A.M. to 5:00 P.M. The public utilizes the hotline to inquire about the project schedule, public involvement, funding, preliminary engineering and design status, crime and safety, CalTrain interface, policy-making issues, environmental compliance issues, as well as other areas of concern.

Project-Related Information Materials. BART staff has developed several public information materials for the public and media. Materials include maps, factsheets, newsletters, and schedules. These materials are distributed via mail upon request and are distributed at all public presentations conducted by BART. For example, the BART–San Francisco Airport Extension newsletter, *Train to Plane*, announcing the release of the FRDEIR/S#2DEIS was mailed to more than 4,000 persons and/or organizations during the week of October 9, 1995. BART staff has also developed poster-style graphics of each proposed alignment alternative under consideration. These graphics are used at public presentations and open-house events.

Project Mailing List. A project mailing list, which currently carries more than 4,000 names, is updated regularly. The database of names includes businesses, residents, property owners, tenants, commuters, interested individuals, local politicians, and media representatives. Anyone can request to be placed on the BART–San Francisco Airport Extension mailing list by calling the project toll-free hotline at (415) 398-2002.

Design Workshops. The public involvement program will not end with the selection of a preferred alignment alternative. BART and SamTrans plan to continue the program through final design and construction. The communities in the project corridor will play a role in assisting with the design of local stations to be consistent with current project and alternative design and mitigation measures. This design process has been modeled on the East Bay extensions (Pittsburg/Antioch and Dublin/Pleasanton), where public participation has helped achieve station designs that fit with community character.

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O'Shea, Peter. Director, Parks & Recreation, City of San Brono. April, December 1994.

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Chapter 11
Distribution List

11.1 Federal Agencies

Advisory Council on Historic Preservation

Federal Aviation Administration

Federal Highway Administration

Federal Railroad Administration

Federal Transit Administration

U.S. Army Corps of Engineers

U.S. Department of Commerce

U.S. Department of Energy

U.S. Department of Housing and Urban Development

U.S. Department of Transportation

U.S. Environmental Protection Agency

U.S. Fish and Wildlife Service

U.S. Geological Survey

U.S. Department of the Interior

U.S. National Park Service

U.S. Soil Conservation Service

11.2 State Agencies

California Air Resources Board

California Coastal Commission

California Department of Conservation

California Department of Education

California Department of Fish and Game

California Department of General Services

California Department of Health Services

California Department of Housing and Community Development

California Department of Parks and Recreation

California Department of Transportation (Caltrans), District 4

California Department of Water Resources

California Energy Commission

California Highway Patrol

California Public Utilities Commission

California Transportation Commission

California Water Resources Control Board

Native American Heritage Commission

Public Utilities Commission

State Cemetery Board

State Clearinghouse, Office of Planning and Research

State Lands Commission

State Office of Historic Preservation

11.3 Regional Agencies

Association of Bay Area Governments

Bay Area Air Quality Management District

California Regional Water Quality Control Board, San Francisco Bay Region

Metropolitan Transportation Commission (MTC)

San Francisco Bay Conservation and Development Commission

11.4 Local Agencies

Bay Area Rapid Transit District (BART)

City and County of San Francisco

City of Burlingame

City of Millbrae

City of San Bruno

City of San Jose

City of South San Francisco

County of San Mateo

Pacific Gas and Electric Company

Peninsula Joint Powers Board

San Francisco International Airport

San Francisco Municipal Railway

San Francisco Public Utilities Commission

San Mateo County Flood Control District

San Mateo County Transit District (SamTrans)

Santa Clara County Traffic Authority

Santa Clara County Transit District

Town of Colma

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- Jane Baker, MTC
- Councilmember Beverly Barnard, San Bruno
- Michael Bernick, President, BART Board of Directors
- Nello Bianco, former Chairperson/BART Director
- James Fang, BART Director
- Mayor Joe Fernekes, South San Francisco
- Mayor Janet Fogarty, Millbrae
- Councilmember Larry Franzella, San Bruno
- Supervisor Mary Griffin, MTC

Steering Committee Members

- Tom Huening, SamTrans Director
- Mayor Ted Kirschner, Colma
- Frances Liston, Town Manager, Colma
- Mayor Rosalie O'Mahony, Burlingame
- Michael Nevin, SamTrans Director
- Margaret K. Pryor, BART Director
- Councilmember Dan Quigg, Millbrae
- Councilmember Mike Spinelli, Burlingame
- Albert Teglia, Chairman, SamTrans Board of Directors

11.5 Organizations

Bay Area Council

Bay Relations

Coalition of Colma Cemeteries

League of Women Voters of San Mateo County

Millbrae Advisory Committee

Sierra Club

11.6 Libraries

Atherton Branch Library

Belmont Branch Library

Brisbane Library

Burlingame Branch Library

Burlingame Library

East Palo Alto Branch Library

Foster City Branch Library

Grand Avenue Branch Library

Half Moon Bay Library

Hillsdale Branch Library

John D. Daly Library

Institute of Governmental Studies Library, University of California, Berkeley

Menlo Park Library

Millbrae City Library

MTC - ABAG Library, Oakland

Pacifica Branch Library

Portola Valley Branch Library

Redwood City Library

San Bruno Public Library

San Carlos Branch Library

San Francisco Main Library

San Mateo County Library

San Mateo Library

Serramonte Main Branch Library

Westlake Branch Library

West Orange Branch Library

Woodside Branch Library

11.7 Schools and Hospitals

Belle Air Elementary School

El Camino High School

Kaiser Medical Center

Lomita Park School

Los Cerritos Elementary School

San Bruno Park School District

San Mateo Unified High School District

South San Francisco High School

APPENDIX A
Glossary/Acronyms

Advisory Committee
A project committee comprised of one appointed representative and one appointed alternate from Colma, South San Francisco, San Bruno, Millbrae, Burlingame, MTC and the SFIA which acts in an advisory capacity on behalf of the members' city or organizations and makes recommendations to the Steering Committee.

Aerial guidance or structure
An above-ground design where tracks and stations are supported by columns and/or footings.

Airport Light Rail System (ALRS)
The transit, consisting of a dual fixed guideway alignment with trains moving in both directions, would be constructed by SFIA in two phases. In the first phase (1996), SFIA will construct the system from the Ground Transportation System to parking lots D and DD. In the long-term (by 2006), the system is proposed to be connected to the ferry terminal and the FBO commuter facility on the east side of the Airport. (Also called a "people mover," "automated guideway transit," or "monorail.")

Alignment
Horizontal and/or vertical geometric elements which define the location of a roadway or fixed-guideway transit facility.

Alluvium
An unconsolidated, terrestrial sediment composed of sorted or unsorted sand, gravel, and clay that have been deposited by water.

Alternatives Analysis/Draft Environmental Impact Statement/Draft Environmental Impact Report (AA/DEIS/DEIR)
An AA/DEIS/DEIR for the BART–San Francisco Airport Extension was prepared under the direction of the Metropolitan Transportation Commission and released for public and agency review in March 1992.

Annualized capital cost
A one time capital cost converted into an annual value which incorporates both the depreciation on the capital item and the foregone interest on the money invested in the project.

Arterial roadway
A roadway with partial control of access, with some intersections at grade, and intended to move high volumes of traffic over long distances at high speed.

Artifacts
Any portable object used and/or modified by civilization (particularly during prehistoric times).

At grade
BART or other transit running on the surface at the existing ground level.

At-grade crossing
Any intersection of two or more flows of traffic at the same elevation (possibly involving more than one mode of transportation).

Average daily traffic (ADT)
The total volume of traffic during a given time period divided by the number of days in that same period, representative of average traffic in a one-day time period.

Average wait time
Average time spent by passengers in the station (or stop) waiting for service.

Average weekday
A measurement of average conditions during one weekday.

Background concentration
The air pollutant level that would exist at a site in the absence of other air pollution sources in the vicinity of that site.

BART build alternatives
Includes all alternatives and design options except the No Build and TSM Alternatives.

British thermal unit (Btu)
An energy unit equal to the quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit. One therm equals 100,000 Btu.

California Environmental Quality Act (CEQA)
The California Environmental Quality Act sets forth specific guidelines for the production of an informational document (EIR) which needs to be prepared by an agency and reviewed by decision makers prior to approving a project. The act also requires that each public agency adopt its own objectives, criteria, and procedures to implement the goals and objectives of CEQA.

Capital costs
Nonrecurring costs required to construct transit systems, including costs of right-of-way, facilities, rolling stock, power distribution, administrative and design costs, and financing charges during construction.

Concentration
A measure of the amount of an air pollutant in the ambient air, having the units of mass per volume. (Also, called level.)

Criteria air pollutants
Those air pollutants which have been recognized by the EPA as potentially harmful and for which standards have been set to protect public health and welfare. The criteria air pollutants are carbon monoxide, sulfur dioxide, particulates, nitrogen dioxide, ozone, hydrocarbons, and lead.

Cut-and-cover
A method of subway construction in which a trench is first excavated, a box structure is constructed within the trench, the trench is backfilled, and the surface is restored.

dBA
The sound level obtained through the use of A-weighting characteristics specified by the American National Standards Institute (ANSI) Standard S1.4-1971. The unit of measure is the decibel (dB), commonly referred to as dBA when A-weighting is used. The "A" weighting scale closely resembles human response to noise.

Design Option
Design variation of a major alignment alternative.

Disturbed habitat
A habitat in which naturally occurring ecological processes and species interactions have been significantly disrupted by the direct or indirect results of human presence and activity.

Downtown San Bruno Station
The proposed San Bruno subway station located south of San Bruno Avenue, generally bordered by San Mateo, Third, and Angus Avenues (formerly referred to as the "Sammut" or "Artichoke Joe" site).

Draft Environmental Impact Report (DEIR)
An informational document required by CEQA that compares the existing conditions of a proposed project area with the conditions after a proposed project is constructed to determine any impacts which may result from implementation of the project and suggests ways to mitigate those impacts.

Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement (DEIR/SDEIS)
For the proposed BART–San Francisco Airport Extension, the draft environmental document satisfying CEQA and NEPA.

Ecologically sensitive area
An area valued locally for its rare or sensitive habitat which exists in a relatively undisturbed, natural state and supports indigenous species.

Elevated guideway
A guideway which is positioned above the normal activity level, e.g., elevated over a street.

Emission control
Method by which emissions are governed in an effort to minimize the amount of pollutants and/or noise emitted.

Emission inventory
A listing by emission source of the amounts of air pollutants released into the atmosphere.

Emission source
The origin of an air pollutant, e.g., automobiles and trucks are sources of carbon monoxide, hydrocarbons, and nitrogen oxides.

Emissions
Particulate, gaseous, noise, or electro-magnetic by-products of transit systems or vehicle.

Endangered species
According to the Federal Endangered Species Act of 1973, endangered species are any species in danger of extinction throughout all or a significant portion of its range, other than an insect determined by the Secretary of the Interior to constitute a pest whose protection under the provisions of this act would present an overwhelming and overriding risk to man.

Energy
The capability of doing work. Forms of energy include kinetic, potential, thermal, electromagnetic, and nuclear. One form of energy may be converted to another; e.g., in hydroelectric plants, the conversion is from potential to kinetic to electromagnetic energy.

Equity
The incidence of fairness and the distribution of costs and impacts among population subgroups.

Facilities energy
A portion of the operational energy that includes the energy to operate parking lots, administration buildings, and other facilities. It does not include propulsion or maintenance energy. (Also, called station energy.)

Fare
The authorized amount (cash or token) paid or valid transfer, pass, etc., presented for a transit ride.

Federal Transit Administration (FTA)
The Lead Agency for the federal environmental process and for funding for the BART–San Francisco Airport Extension.

Feeder service
Local transit service which feeds some other (usually faster and higher capacity) transit service.

Focused Recirculated Draft Environmental Impact Report/Supplemental # 2 Draft Environmental Impact Statement (FRDEIR/S#2DEIS)
The FRDEIR/S#2DEIS was prepared to evaluate aerial design options to the tunnel portion of Alternative VI (chosen as the Locally Preferred Alternative) for the BART Extension project. These design projects (known as the Alternative VI Aerial Design Option) provides east-west aerial access to the planned San Francisco Airport International Terminal and straight-through mainline service along the CalTrain right-of-way to a Millbrae Avenue BART/CalTrain Station. This document focuses only on the segment of Alternative VI south of Angus Avenue in San Bruno to the end of the tailtracks in Burlingame. Only significant new or different impacts due to the Alternative VI Aerial design Option are addressed, compared to the Alternative VI Tunnel Option.

Grade separated
Parallel or crossing lines of traffic that are vertically separated from each other and do not share a common intersection.

Ground Transportation Center (GTC)
A portion of the San Francisco International Airport's Master Plan that calls for the development of a central point outside the terminal area along the entrance roadway for passengers arriving or departing the airport via rental cars, shuttle vans, and buses.

Headway
The scheduled time separation between two trains both traveling in the same direction on the same track.

Hydrocarbons
Specifically, non-methane hydrocarbons that contribute to the formation of photochemical oxidants (commonly known as smog), primarily ozone.

I-380/San Bruno Station
The San Bruno subway station location just south of the I-380 freeway and north of San Bruno Avenue.

Interchange
The system of interconnecting ramps between two or more intersecting roadways or gradeways which are grade separated.

Intermodal station
A station on the project alignment where all three rail modes (BART, CalTrain, and Airport Light Rail) meet and allow transfers between modes.

Joint development
Opportunities for the development or redevelopment of parcels adjacent to the project alignment (in station areas) in a manner which would support both the transit investment and the community objectives through the use of both public and private funds.

Land development pattern
The use, types, and intensity of developments. Land development patterns affect trip demand, average trip length, and therefore energy consumption.

Landscaped habitat
A habitat in urban areas having limited native species. Vegetation generally consists of mowed lawns and exotic trees and bushes.

L_{dn}
The day/night average noise level.

Level of Service (LOS)
A qualitative measure that represents the collective factors of travel under a particular volume condition. A measure of traffic congestion.

Line source
A general classification of the origin of an air pollutant, e.g., highways and other roads are line sources of carbon monoxide emission.

Load factor
The average ratio of passengers to seats during some specified period of operation of a public transit route.

Local service
A type of operation involving frequent stops and consequent low speeds, the purpose of which is to deliver and pick up transit passengers as close to their destinations or origins as possible.

Locally Preferred Alternative (LPA)
See Proposed Project.

Mid-point of Construction
Mid-point of construction defines the date to which project costs are escalated (inflation is applied). Mid-point of construction is defined separately for each element of project cost, so that elements completed early in construction process reflect least inflation of current costs.

Mitigation
Action taken to reduce or alleviate the negative effects of the construction or operation of a proposed project.

Mode
A particular form or method of travel.

Mode split
Forecast of the proportion of total person-trips that would use various modes of transportation, including transit and cars.

Model runs
A computer simulation of the behavior of traffic and transit users used to estimate traffic levels, routes taken, and transit patronage.

National Ambient Air Quality Standards (NAAQS)
A federal limit on levels of atmospheric contamination necessary to protect the public from adverse effects on health (primary standards) and welfare (secondary standards).

National Environmental Policy Act (NEPA)
The federal law that requires an informational document (EIS) to be prepared before a project is undertaken by a federal agency.

National Historic Preservation Act of 1966
The Act which established the National Register and State Historic Preservation programs, and set forth guidelines and regulations for grants and environmental review of projects involving federal funding.

National Register of Historic Places (NRHP)
The official list of the nation's cultural resources worthy of preservation.

No Build Alternative
An alternative that assumes no BART–San Francisco Airport Extension is constructed. Also assumes no changes to the transportation facilities in the study area beyond those elements that will be in operation or under construction by the time the Draft EIR/Supplemental Draft EIS is completed in 1994.

Nonattainment area
An area designated by the EPA as presently violating the National Ambient Air Quality Standards, based on archival air quality data.

Off-peak
Those periods of the day where demand for transit service is not at a maximum.

One hundred year floodplain
An area of land susceptible to flooding during a storm which would historically occur only once every 100 years.

Operating costs
Recurring costs incurred in operating transit systems, including maintenance of facilities and equipment, fuel, supplies, wages and salaries, employee benefits, insurance, taxes, and other administrative costs. Amortization of facilities and equipment is not included.

Operating revenue
The gross income from operation of the transit system including fares, concessions, advertising, etc. Does not include interest from securities, non-recurring income from sale of capital assets, etc.

Operational energy
The energy used for vehicle propulsion, facilities, and maintenance for a specified period, usually one year.

Particulate
See Total Suspended Particulates.

Passenger mile
An amount of travel equivalent to one passenger traveling one mile.

Patronage
The number of person-trips carried by a transit system over a specified time period.

Peak hour
The hour of the day in which the maximum demand for service is experienced, accommodating the largest number of automobiles or transit patrons.

Peak period
A specified time period for which the volume of traffic is greater than that during other similar periods.

Person-trip
A trip made by a person using any travel mode.

Photochemical oxidants (smog)
Gaseous pollutants formed from reactions of hydrocarbons and nitrogen oxides in the presence of sunlight, e.g., ozone.

Point source
A general classification of the origin of an air or water pollutant, usually characterized as smokestacks.

Pollutant
Smoke, dust, fumes, odors, and/or other elements in the ambient air that have potential for harmful effects. (Also, called air contaminant.)

Power
The time rate of energy use.

Project Corridor
The area encompassing all lands generally within a 1/4-mile distance of the project alignment. It is within this area that most of the local impacts would occur.

Project Study area
A geographic area that encompasses the vicinity of the project and serves as the area for which project related traffic impacts were assessed. It is an area in northern and mid-San Mateo County, bound by I-280 to the west, the San Mateo/San Francisco county limits to the north, San Francisco Bay to the east, and the southern city limits of San Mateo to the south.

Proposed Project
For this environmental document, the Locally Preferred Alternative that was selected by the BART and SamTrans Boards on November 28, 1995 is the proposed project.

Retained cut
BART or other transit running below the existing ground level in a below-surface excavation with concrete walls and left open on top.

Right-of-way (ROW)
Land or rights to land used or held for transit operations of public way.

Riparian habitat
A habitat type associated with stream and lake margins and characterized by dense vegetation consisting primarily of willow, alder, and cottonwood species and supporting a wide variety of waterfowl, songbirds, amphibians, and small mammals.

Runoff
The rainwater which directly leaves an area in surface drainage, as opposed to the amount that seeps out as groundwater.

Section 106
A portion of the National Historic Preservation Act of 1966 which establishes a review procedure of cultural resources that may be affected by projects receiving federal funds.

Section 4(f) land
Section 4(f) of the Department of Transportation Act applies to the following properties: any publicly owned land from a public park, recreational area, or wildlife and waterfowl refuge, or any land from an historic site used by the project.

Sensitive receptor
A local area or site which supports activities easily disrupted by audio or visual intrusions or distractions, such as a park, historic landmark, or residential neighborhood.

Smog
See photochemical oxidants.

Steering Committee
A project committee comprised of four BART Directors and four SamTrans Directors which acts in a policy-making capacity and makes policy-level decisions based on information provided by BART/SamTrans staff and the Advisory Committee.

Subway
BART or other transit totally underground, whether tunneled, excavated, or in a box culvert covered after construction.

Tailtrack
Facilities to turnback trains and storage tracks at the end of the line.

Terminus
A transit station located at the end of a transit line.

Threatened species
According to the Federal Endangered Species Act of 1973, any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Total Suspended Particulates (TSP)
Air pollutants which consist of solid particles (dust, lead, salts, etc.) suspended in the atmosphere. A criteria air pollutant.

Total travel time
The total elapsed time between trip beginning and end.

Traction Power Substations
Take 34,500 volt alternating current from underground PG&E power lines and use transformers to reduce the voltage and rectifiers to convert the alternating current to 1,000 volt direct current. This current is supplied to the third rail to power BART trains.

Transfer
The portion of a trip between two connecting transit lines, both of which are used for completion of the trip.

Transit
A transportation system principally for moving people in an urban area and made available to the public, usually through paying a fare.

Transit centers
An off-street station with shelter where a large number of transit vehicles and passengers can be brought together with safety and convenience.

Transportation accessibility
Both the ease of movement in a corridor and the proximity of residents to regional jobs.

Transportation Systems Management (TSM) Alternative
Consists of currently planned or funded major transportation improvements within the study area, including increased CalTrain service, repair of earthquake-damaged freeway sections, and local circulation roadway improvements.

Travel time
The time required to travel between two points, not including waiting time.

Trip
The one-way movement of one person between origin and destination, including the walk to and from the means of transportation.

Trip demand
The number and type (public or private origin and destination) of trips measured or calculated in a specified area having a given land development pattern. Trip demand also depends on prevailing economic, behavioral, and attitudinal conditions.

Trip length
The number of miles per trip. This is usually an average number for a specified trip type, area, and analysis year.

Vehicle mile
An amount of travel equivalent to one vehicle traveling one mile.

Vehicle occupancy
The number of persons per vehicle. Usually an average number for a specified trip type, area, and analysis year.

Viewshed
An area from which a facility is generally visible from an array of points (individual viewpoints can be blocked by foreground obstructions, but still be within the general viewshed).

Visually significant areas
A local area that is found to be visually important to the community by virtue of its prominence, distinctive character, vulnerability to change, array of sensitive or high quality landscape elements (natural or built), or other appearance factors.

Wetlands
Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, under normal conditions, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and similar areas.

Wye-stub
Track that branches off from mainline track in a wye "Y" configuration that ends as a stub.

ACRONYMS

AA/DEIS/DEIR	Alternatives Analysis/Draft EIS/Draft EIR
ABAG	Association of Bay Area Governments
AC	alternating current
ACHP	Advisory Council on Historic Preservation
ACOE	U.S. Army Corps of Engineers
ADA	average daily attendance
ALRS	Airport Light Rail System
ALUC	Airport Land Use Commission
ALUP	Airport Land Use Plan
ANSI	American National Standards Institute
APE	Area of Potential Effects
BAAQMD	Bay Area Air Quality Management District
BART	Bay Area Rapid Transit District
BATC	Bay Area Transit Consultants
BEP	State Bond Expenditure Plan
bgs	below ground surface
BLM	Bureau of Land Management
BMP	Best Management Practice
Btu	British thermal units
CalTrain	Peninsula Commute Service
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCR	California Code of Regulations
CCSF	City and County of San Francisco
CDFG	California Department of Fish and Game
CEI	Cost Effectiveness Index
CEQA	California Environmental Quality Act
CERCLIS	EPA Comprehensive Environmental Response Compensation and Liability Information System
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHP	California Highway Patrol
CIP	Capital Improvements Plan
CMP	Congestion Management Plan
CNPS	California Native Plant Society
CO	carbon monoxide

CPI	Consumer Price Index
CTC	California Transit Commission
CVC	California Vehicle Code
dB	decibels
dBA	A-weighted decibels
DC	direct current
DEIR/SDEIS	Draft EIR/Supplemental Draft EIS
DOT	Department of Transportation
DTSC	Department of Toxic Substances Control
EIR/S	Environmental Impact Report/Statement
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
ERNS	Emergency Response Notification System
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEIR/FEIS	Final EIR/Final EIS
FEMA	Federal Emergency Management Agency
FESA	Federal Endangered Species Act
FFGA	full funding grant agreement
FOE	Finding of Effect
FRDEIR/S#2DEIS	Focused Recirculated Draft EIR/Supplemental#2Draft EIS
FTA	Federal Transit Administration (formerly UMTA)
FY	fiscal year
gpd	gallons per day
GTC	Ground Transportation Center
GTC/RCG	Ground Transportation Center/Rental Car Garage
Hz	hertz
ISTEA	Intermodal Surface Transportation Efficiency Act
JPB	Peninsula Corridor Joint Powers Board
kV/m	kilovolt per meter
kW	kilowatt
L_{dn}	a measure of day/night levels
L_{eq}	an average of levels (energy equivalent) over time
LOS	level of service
LPA	Locally Preferred Alternative
LUST	leaking underground storage tank
µm	micron
MCE	maximum credible earthquake

mG	milligauss
mgd	millions of gallons per day
MIS	Major Investment Studies
MMP	Mitigation Monitoring Plan
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPO	Metropolitan Planning Organization
msl	mean sea level
MTC	Metropolitan Transportation Commission
Muni	San Francisco Municipal Railway
MVA	megavolts-amperes
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NPL	National Priorities List
NPPA	Native Plant Protection Act
NRHP	National Register of Historic Places
O_3	ozone
OHW	Ordinary High Water
O&M	operating and maintenance (costs)
Par-Clo	partial clover leaf
Pb	lead
PFCs	Passenger Facilities Charges
PG&E	Pacific Gas and Electric Company
PM_{10}	particulate matter less than 10 microns in diameter
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
ROG	reactive organic gases
ROW	right-of-way
RPP	residential permit parking program
RTP	Regional Transportation Plan
RUST	registered underground storage tank
RWQCB	Regional Water Quality Control Board

SamTrans	San Mateo County Transit District
SCADA	Supervisory control and data acquisition
SFGS	San Francisco garter snake
SFIA	San Francisco International Airport
SFWD	San Francisco Water Department
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	sulfur dioxides
SO_x	sulfur oxides
SMCFCD	San Mateo County Flood Control District
SPTCo	Southern Pacific Transportation Company
SRTP	Short Range Transit Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TAC	Technical Advisory Committee
TCI	Transit Capital Improvement
TIP	Transportation Improvement Program
TSD	treatment, storage and disposal
TSM	Transportation Systems Management
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
V/C	volume/capacity
VDC	volts direct current
VMT	vehicle miles traveled

APPENDIX B
Transit

Appendix Table B
Aerial Design Option LPA
BART Station Entries and Exits (1)
Daily Volumes by Access Mode and Trip Purpose

	1993 (Base Year)		1998 (Year of Opening)		2010 (Horizon Year)	
	Productions	Attractions	Productions	Attractions	Productions	Attractions
Daly City BART Station						
Home-Based Work						
Walk	936	180	985	195	1,029	213
Auto	4,761	–	5,007	–	5,232	–
Transit	2,096	584	2,204	634	2,303	693
TOTAL	7,793	764	8,196	829	8,564	906
Non-Work						
Walk	444	113	467	123	488	134
Auto	980	–	1,031	–	1,077	–
Transit	980	534	1,031	580	1,077	634
TOTAL	2,404	647	2,528	703	2,642	768
Air Passengers						
Walk	13	13	15	15	19	19
Auto	68	68	80	80	99	99
Transit	75	75	87	87	108	108
TOTAL	156	156	183	183	226	226
TOTAL						
Walk	1,394	306	1,467	333	1,536	366
Auto	5,810	68	6,118	80	6,408	99
Transit	3,150	1,193	3,322	1,302	3,488	1,435
TOTAL	10,353	1,567	10,907	1,715	11,432	1,900

	1993 (Base Year)		1998 (Year of Opening)		2010 (Horizon Year)	
	Productions	Attractions	Productions	Attractions	Productions	Attractions
Colma BART Station						
Home-Based Work						
Walk	1,084	196	1,140	212	1,191	232
Auto	5,170	–	5,437	–	5,681	–
Transit	5,328	455	5,603	494	5,855	540
TOTAL	11,582	651	12,180	706	12,727	772
Non-Work						
Walk	376	93	395	101	413	110
Auto	748	–	787	–	822	–
Transit	748	441	787	479	822	523
TOTAL	1,872	534	1,969	579	2,057	633
Air Passengers						
Walk	–	–	–	–	–	–
Auto	–	–	–	–	–	–
Transit	6	6	6	6	8	8
TOTAL	6	6	6	6	8	8
TOTAL						
Walk	1,460	288	1,535	313	1,604	342
Auto	5,918	–	6,223	–	6,503	–
Transit	6,082	902	6,396	979	6,685	1,071
TOTAL	13,459	1,190	14,155	1,292	14,792	1,413

Source: MTC, BART-SFO AA/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO SDEIS/DEIR Patronage Forecasts, October 1993
Parsons Brinckerhoff, December 1993

(1) "Production and Attraction" format used. Productions are those trips where the station is at the home end of the trip. Attractions are those trips where the station is at the destination end of the trip.

Appendix Table B (cont'd)
Aerial Design Option LPA
BART Station Entries and Exits (1)
Daily Volumes by Access Mode and Trip Purpose

	1993 (Base Year)		1998 (Year of Opening)		2010 (Horizon Year)	
	Productions	Attractions	Productions	Attractions	Productions	Attractions
Hickey BART Station						
Home-Based Work						
Walk	1,660	126	1,746	137	1,824	150
Auto	2,878	–	3,027	–	3,163	–
Transit	301	489	317	531	331	580
TOTAL	4,839	615	5,089	668	5,318	730
Non-Work						
Walk	527	195	554	211	579	231
Auto	348	–	366	–	382	–
Transit	349	268	367	291	383	318
TOTAL	1,223	463	1,286	502	1,344	549
Air Passengers						
Walk	–	–	–	–	–	–
Auto	–	–	–	–	–	–
Transit	8	8	10	10	12	12
TOTAL	8	8	10	10	12	12
TOTAL						
Walk	2,187	321	2,300	349	2,403	381
Auto	3,226	–	3,393	–	3,545	–
Transit	658	765	693	831	726	910
TOTAL	6,071	1,086	6,385	1,180	6,674	1,291

	1993 (Base Year)		1998 (Year of Opening)		2010 (Horizon Year)	
	Productions	Attractions	Productions	Attractions	Productions	Attractions
Tanforan BART Station						
Home-Based Work						
Walk	72	375	76	407	79	445
Auto	1,980	–	2,082	–	2,176	–
Transit	151	4,348	159	4,720	166	5,158
TOTAL	2,203	4,723	2,317	5,127	2,421	5,603
Non-Work						
Walk	66	385	69	418	72	457
Auto	302	–	318	–	332	–
Transit	302	494	318	536	332	586
TOTAL	670	879	704	954	736	1,043
Air Passengers						
Walk	–	–	–	–	–	–
Auto	–	–	–	–	–	–
Transit	4	4	5	5	6	6
TOTAL	4	4	5	5	6	6
TOTAL						
Walk	137	760	145	825	151	902
Auto	2,282	–	2,400	–	2,508	–
Transit	457	4,846	481	5,261	504	5,750
TOTAL	2,877	5,607	3,026	6,086	3,163	6,652

Source: MTC, BART-SFO AA/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO SDEIS/DEIR Patronage Forecasts, October 1993
Parsons Brinckerhoff, December 1993

(1) "Production and Attraction" format used. Productions are those trips where the station is at the home end of the trip. Attractions are those trips where the station is at the destination end of the trip.

Appendix Table B (cont'd)
Aerial Design Option LPA
BART Station Entries and Exits (1)
Daily Volumes by Access Mode and Trip Purpose

	1993 (Base Year)		1998 (Year of Opening)		2010 (Horizon Year)	
	Productions	Attractions	Productions	Attractions	Productions	Attractions
Airport International Terminal BART Station						
Home-Based Work						
Walk	–	1,000	–	1,387	–	1,727
Auto	–	–	–	–	–	–
Transit	17	1,446	24	2,006	30	2,498
TOTAL	17	2,446	24	3,393	30	4,225
Non-Work						
Walk	–	716	–	993	–	1,236
Auto	–	–	–	–	–	–
Transit	119	1,036	165	1,437	206	1,790
TOTAL	119	1,752	165	2,430	206	3,026
Air Passengers						
Walk	2,884	2,884	3,386	3,386	4,180	4,180
Auto	–	–	–	–	–	–
Transit	726	726	852	852	1,052	1,052
TOTAL	3,610	3,610	4,238	4,238	5,232	5,232
TOTAL						
Walk	2,884	4,600	3,386	5,765	4,180	7,143
Auto	–	–	–	–	–	–
Transit	863	3,209	1,042	4,295	1,288	5,340
TOTAL	3,747	7,808	4,427	10,060	5,468	12,483

	1993 (Base Year)		1998 (Year of Opening)		2010 (Horizon Year)	
	Productions	Attractions	Productions	Attractions	Productions	Attractions
Millbrae Avenue BART Station						
Home-Based Work						
Walk	44	935	46	1,015	48	1,109
Auto	4,963	–	5,219	–	5,454	–
Transit	9,964	4,170	10,478	4,527	10,949	4,947
TOTAL	14,970	5,105	15,744	5,541	16,451	6,056
Non-Work						
Walk	73	178	77	193	80	211
Auto	1,311	–	1,379	–	1,441	–
Transit	4,134	1,102	4,348	1,196	4,543	1,307
TOTAL	5,518	1,280	5,803	1,389	6,064	1,518
Air Passengers						
Walk	–	–	–	–	–	–
Auto	–	–	–	–	–	–
Transit	1,034	1,034	1,213	1,213	1,498	1,498
TOTAL	1,034	1,034	1,213	1,213	1,498	1,498
TOTAL						
Walk	116	1,113	122	1,208	128	1,320
Auto	6,274	–	6,599	–	6,895	–
Transit	15,131	6,306	16,039	6,936	16,990	7,752
TOTAL	21,522	7,419	22,760	8,144	24,013	9,072

Source: MTC, BART-SFO AA/DEIR Patronage Forecasts, May 1991
MTC, BART-SFO SDEIS/DEIR Patronage Forecasts, October 1993
Parsons Brinckerhoff, December 1993

(1) "Production and Attraction" format used. Productions are those trips where the station is at the home end of the trip. Attractions are those trips where the station is at the destination end of the trip.

APPENDIX C
Traffic

Appendix Table C
Aerial Design Option LPA
Intersection Level of Service (LOS)

	Intersection	Intersection Control Type(1)	AM Peak Hour 1993	AM Peak Hour 1998	AM Peak Hour 2010	PM Peak Hour 1993	PM Peak Hour 1998	PM Peak Hour 2010
3.	El Camino Real & Hickey Blvd	TS	A	A	A	B	B	B
4.	El Camino Real & Hickey Ext'n	TS	A	A	A	B	B	B
5.	Hickey Sta. Exit & Hickey Ext'n	US	B	B	B	E*	F*	F*
6.	Mission & Hickey Extension	TS	A	A	A	A	A	A
7.	Mission & Hickey Sta. Entr. (KNR)	US	A	A	A	A	A	A
9.	Mission & Hickey Sta. Exit (KNR)	US	B	B	B	B	C	C
8.	Mission & Evergreen	AWS	A	B	B	A	A	A
11.	Mission & New Street	AWS	C	C	C	B	B	B
12.	Hickey Sta. Bus Entr. & New Street	US	C	C	C	A	A	B
10.	Hickey Sta. Entr. & New Street	US	A	A	A	B	B	B
13.	El Camino Real & New Street	TS	A	A	A	A	A	A
14.	Mission & Grand	AWS	B	B	B	B	B	B
15.	Oak & Grand	US	B	B	B	B	C	C
16.	Chestnut & Grand Ave	TS	B	B	B	D	E	E
17.	Mission & Chestnut Sta. Entr.	N/A	-	-	-	-	-	-
18.	Mission & Chestnut Sta. Exit	N/A	-	-	-	-	-	-
19.	Mission & Oak	US	B	B	B	A	A	A
20.	Station Bus Ent. & Arroyo/Oak Ext'n	N/A	-	-	-	-	-	-
21.	El Camino Real & Arroyo	TS	A	A	A	A	A	A
22.	Camaritas & Arroyo	AWS	B	B	B	A	B	B
23.	Junipero Serra Blvd & Westborough	TS	C	C	C	E	E	E
24.	Camaritas & Westborough	TS	A	A	A	A	A	B
25.	El Camino Real & Westborough	TS	B	B	B	C	C	C
26.	Antonette & Chestnut	TS	A	A	A	A	A	A
27.	Mission & Chestnut	TS	A	A	A	A	A	A
28.	El Camino Real & Orange	TS	A	A	A	C	C	C
29.	El Camino Real & Spruce	TS	A	A	A	B	C	C
30.	Huntington & Spruce	TS	A	A	A	A	A	A
31.	El Camino Real & Noor	US	B	C	C	E	E	E
32.	Huntington & Noor	TS	A	A	A	A	A	A
33.	Northbound I-280 & Sneath	TS	A	B	B	B	B	B
81.	Southbound I-280 & Sneath	TS	D	D	D	B	B	B
34.	El Camino Real & Sneath	TS	B	B	B	E*	E*	E**
35.	Huntington & Tanforan Sta. Exit	N/A	-	-	-	-	-	-
36.	Huntington & Sneath	TS	A	A	A	D	D	D
37.	Huntington & Tanforan Sta. Entr.	N/A	-	-	-	-	-	-
38.	Dollar/Herman & Tanforan Ave	US	A	A	A	A	A	A

Source: Parsons Brinckerhoff, April 1994.

* Identifies Significant Direct Project Impacts

** Identifies Significant Cumulative Project Impacts

1) TS - Traffic Signal
US - Unsignalized (Minor street stop signs -- LOS is for worst minor street movement)
AWS - All Way Stop (Stop signs on all approaches)
N/A - Not Applicable to this Alternative

Appendix Table C (cont'd)
Aerial Design Option LPA
Intersection Level of Service (LOS)

Intersection	Intersection Control Type(1)	AM Peak Hour 1993	AM Peak Hour 1998	AM Peak Hour 2010	PM Peak Hour 1993	PM Peak Hour 1998	PM Peak Hour 2010
40. El Camino Real & Westbound I-380	TS	A	A	A	A	A	A
41. El Camino Real & Eastbound I-380	TS	A	A	A	A	A	A
42. Herman & Scott	AWS	A	A	A	A	A	B
43. Huntington & Forest	AWS	A	A	A	D	D	D
44. Northbound I-280 & San Bruno	TS	A	A	A	A	A	A
82. Southbound I-280 & San Bruno	TS	A	A	A	A	A	A
45. El Camino Real & San Bruno	TS	A	A	A	B	B	B
47. Huntington & San Bruno	TS	A	A	B	A	A	A
48. San Mateo & San Bruno	TS	B	B	B	A	B	B
106. San Mateo & Lumber Yd KNR Ent.	N/A	-	-	-	-	-	-
107. San Mateo & Lumber Yd KNR Exit	N/A	-	-	-	-	-	-
53. San Mateo & Lumber Yard Entr.	N/A	-	-	-	-	-	-
49. Second & San Bruno	TS	D	D	D	E	E	E
50. Third & San Bruno	TS	A	A	A	A	A	A
59. San Mateo & First	US	A	A	A	A	A	A
60. San Mateo & Huntington	US	C	D	D	D	D	D
61. San Mateo & Angus	AWS	B	B	B	C	D	D
62. Huntington & Angus	AWS	B	B	B	C	C	D
63. First & Angus	US	A	A	A	B	C	C
54. So. Airport & I-380 On-Ramp	TS	A	A	A	A	B	C
55. So. Airport & I-380 Off-Ramp	TS	A	A	A	A	A	A
56. So. Airport & San Bruno	TS	A	A	A	A	A	A
57. McDonnell & North BART Ent.	N/A	-	-	-	-	-	-
58. McDonnell & South BART Ent.	N/A	-	-	-	-	-	-
64. El Camino Real & Jenevein	TS	A	A	A	A	A	A
65. El Camino Real & San Felipe	TS	A	A	A	A	A	A
66. Huntington & San Felipe	US	A	A	A	A	A	A
67. El Camino Real & Santa Inez	TS	A	A	A	A	A	A
68. San Antonio (Hunt.) & Santa Inez	US	A	A	A	A	A	A
69. El Camino Real & Center	TS	A	A	A	A	A	A
70. San Anselmo & Center	US	A	A	A	A	A	A
71. Monterey & Center	US	A	A	A	A	A	A
108. Bay & Center	N/A	-	-	-	-	-	-
72. El Camino Real & Millbrae	TS	D	E*	E*	D	D	D
109. New Road & NB 101 Off-Ramp	AWS	-	-	-	-	-	-
110. New Road & SB 101 Ramps	AWS	-	-	-	-	-	-
111. New Road & SFO Sta. Exit	US	-	-	-	-	-	-
112. New Road & SFO Sta. Ent./Exit	AWS	-	-	-	-	-	-

Source: Parsons Brinckerhoff, April 1994.
* Identifies Significant Direct Project Impacts
** Identifies Significant Cumulative Project Impacts
1) TS - Traffic Signal
US - Unsignalized (Minor street stop signs -- LOS is for worst minor street movement)
AWS - All Way Stop (Stop signs on all approaches)
N/A - Not Applicable to this Alternative

Appendix Table C (cont'd)
Aerial Design Option LPA
Intersection Level of Service (LOS)

Intersection	Intersection Control Type(1)	AM Peak Hour 1993	AM Peak Hour 1998	AM Peak Hour 2010	PM Peak Hour 1993	PM Peak Hour 1998	PM Peak Hour 2010
80. Rollins & Millbrae	TS	B	C	C	C	C	C
118. Dollar & So. Linden	N/A	-	-	-	-	-	-
119. San Mateo & Produce/Airport Blvd	TS	A	A	A	C	C	C
123. El Camino Real & Hillcrest	TS	A	A	A	A	A	A
127. El Camino Real & Murchison	TS	D	D	D	C	C	C
128. California & Murchison	US	A	A	A	C	C	C
130. El Camino Real & Trousdale	TS	B	B	C	B	B	B
133. El Camino Real & Broadway	TS	A	A	A	A	A	A
134. California & Broadway	TS	D	D	D	D	D	E
135. Rollins & Broadway	TS	B	C	C	C	C	C
146. Rollins & BART Access (Garden Ln)	TS	A	A	A	A	A	A
162. Huntington & Tanforan Dwy North	US	D	D	D	F*	F*	F*
163. Huntington & BART Entrance	TS	A	A	A	A	A	A
164. Huntington & BART Exit	TS	A	A	A	A	A	A
165. Huntington & Tanforan Dwy South	US	A	A	A	D	D	D
166. Rollins & Adrian	TS	A	A	A	A	A	A
167. Sneath & Sears Entrance	AWS	D	D	D	E*	E*	F*

Source: Parsons Brinckerhoff, April 1994.

* Identifies Significant Direct Project Impacts

** Identifies Significant Cumulative Project Impacts

1) TS - Traffic Signal
US - Unsignalized (Minor street stop signs -- LOS is for worst minor street movement)
AWS - All Way Stop (Stop signs on all approaches)
N/A - Not Applicable to this Alternative

APPENDIX D
Air Quality

Appendix D
Air Quality Impacts Assessment Methodology

D.1 Introduction

This appendix describes the methodologies used to determine regional and local air quality impacts associated with the Aerial Design Option LPA and to determine conformity of the project to the State Implementation Plan. This appendix provides more detail than is contained in Chapter 3, Section 10.

D.2 Regional Impacts

Regional air quality impacts were evaluated on the basis of total regional vehicular emissions. The "region" is the nine-county Bay Area air basin under the jurisdiction of the BAAQMD. The calculation of regional emissions was based on vehicle-miles-traveled (VMT) data supplied by MTC (1993c, 1994) and on estimates of vehicular pollutant emission factors.

MTC provided both daily and peak-hour regional VMT data for the 1992 LPA, No Build Alternative, and TSM Alternative. The daily VMT data represent the total number of vehicle miles traveled per day (veh-mi/day) within the region. The peak-hour VMT data represent the total number of vehicle miles traveled during the worst-case hour in the day (veh-mi/hr). The traffic analysis determined that the daily and peak-hour VMT data would not vary between the BART build alternatives by more than 1 to 2 percent, which is not considered a significant amount in this analysis. Therefore, the daily and peak-hour VMT values for the Aerial Design Option LPA were assumed equal to those provided by the MTC for the 1992 LPA.

Vehicular pollutant emission factors were derived using the most recent version of the EPA-approved EMFAC7F vehicular emissions model: EMFAC7F Version 1.1. Emission factors, with units of grams per vehicle mile (g/veh-mi), were derived for NO_x, ROG, CO, and PM_{10}. (The EMFAC7F model does not produce SO_2 emission factors.) Assumptions made in the derivation of emission factors were consistent with those used by MTC in the 1993 TIP analysis.

Cumulative Impacts

The peak-hour and daily VMT data were used in conjunction with the vehicular emission factors to estimate worst-case cumulative regional emissions in pounds per hour (lb/hr) and tons per year (ton/yr), respectively. Cumulative regional emissions were calculated for the Aerial Design Option LPA, TSM Alternative, and No Build Alternative.

Project-Specific Impacts

CEQA requires comparison of the Aerial Design Option LPA in future years against existing conditions. For this analysis, existing conditions are defined as the No Build Alternative in the 1993 base year. Thus, project-specific or "net" regional emissions for a given analysis year were calculated as the cumulative

regional emissions under the Aerial Design Option LPA in the analysis year minus the cumulative regional emissions under the No Build Alternative in the 1993 base year:

$$NE_{i,\,LPA,\,y} = CE_{i,\,LPA,\,y} - CE_{i,\,NB,\,1993}$$

where:

$NE_{i,\,LPA,\,y}$ = Net regional emissions of pollutant i under the Aerial Design Option LPA in year y (lb/day or ton/yr);

$CE_{i,\,LPA,\,y}$ = Cumulative regional emissions of pollutant i under the Aerial Design Option LPA in year y (lb/day or ton/yr); and

$CE_{i,\,NB,\,1993}$ = Cumulative regional emissions of pollutant i under the No Build Alternative in 1993 (lb/day or ton/yr).

Net regional emissions were calculated for the Aerial Design Option LPA only; the net calculation is not applicable to the TSM and No Build Alternatives.

D.3 Local Impacts

Air pollutants associated with the Aerial Design Option LPA that are of concern on a local scale are PM_{10} and CO. Project-specific PM_{10} and CO emissions are produced by BART-associated vehicular traffic at roadway intersections and BART station parking facilities. Significant local impacts would occur if project-specific PM_{10} or CO emissions resulted in airborne PM_{10} or CO concentrations that, when added to background levels, exceeded a state or federal ambient air quality standard.

PM_{10} Impacts

There is currently no EPA-approved model for analysis of local PM_{10} impacts, and quantitative analysis of local PM_{10} impacts is not required as part of the air conformity assessment. Local PM_{10} impacts were qualitatively evaluated on the basis of project-specific regional PM_{10} emissions. Specifically, regional PM_{10} emissions under the Aerial Design Option LPA in a given analysis year were compared against regional PM_{10} emissions under existing conditions (the No Build Alternative in the 1993 analysis year). An overall net decrease in regional PM_{10} emissions could reasonably be interpreted to show that the project is unlikely to cause localized exceedances of the PM_{10} standards. This "Build/No Build" test approach is specified by EPA, and is used by MTC in its evaluation of regional transportation plans and programs; this test can reasonably be assumed appropriate at the project level as well.

CO Impacts

Quantitative analysis of local CO impacts is required as part of the air conformity assessment. Significant local CO impacts would occur if CO emissions from BART-associated vehicular traffic resulted in airborne CO concentrations that, when added to background levels, exceeded a state or federal ambient CO standard. The analysis of local CO impacts was performed for roadway intersections and BART parking facilities where air quality impacts are expected to be greatest. The methodology for determining local CO impacts is consistent with EPA conformity assessment procedures in 40 CFR 93.131 and with typical CEQA/NEPA air quality impact analyses.

Background CO Concentrations

The analysis of local CO impacts requires the addition of background CO concentration values to model-predicted, traffic-associated CO concentration values. The estimation of background CO concentrations is based on a "rollback factor" method specified by the BAAQMD (1985; revised in 1991 and 1993). Site-specific background CO concentrations in future analysis years are calculated by multiplying a site-specific, measured background CO concentration from 1989 by analysis-year-specific BAAQMD rollback factors. The site-specific 1989 background CO concentration, BAAQMD rollback factors, and resulting site-specific 1993, 1998, 2000, and 2010 background CO concentrations are presented in Table D-1.

Selection of Roadway Intersections and BART Parking Facilities

Roadway intersections where air quality could be substantially affected by the project were determined by reviewing the traffic analysis, since local CO impacts are typically a function of vehicular traffic. Following EPA procedures and guidance, 24 intersections were selected for local CO analysis. The intersections selected included 1) those intersections where CO concentrations are expected to be highest and 2) those intersections expected to undergo the greatest change from existing conditions as a result of the project. Local CO impacts were also evaluated at parking facilities at the Tanforan and Millbrae Avenue Stations, where air quality impacts are expected to be greatest due to the relatively large number of vehicles exiting in the P.M. peak hour.

Dispersion Modeling

CO concentrations were calculated at the selected roadway intersections by the EPA-recommended CALINE4 and CAL3QHC dispersion models, using worst-case meteorological assumptions; vehicular emission factors derived with the EMFAC7F emissions model; and traffic data specific to the BART alternative, analysis year, and peak traffic hour (A.M. or P.M.). CO concentrations were calculated at worst-case artificial receptor locations, purposely placed to determine the highest CO concentrations at each intersection.

The selected BART station parking facilities are adjacent to roadway intersections also included in the local CO analysis; the Tanforan Station is adjacent to the intersection of Huntington Avenue and Sneath Lane, while the Millbrae Station is adjacent to the intersection of Rollins Road and Millbrae Avenue. Airborne CO concentrations at these locations would likely include contributions from both the station parking facilities and the adjacent roadway intersections. For this reason, analyses of the Tanforan and Millbrae Station parking facilities were combined with analyses of the Huntington Avenue/Sneath Lane and Rollins Road/Millbrae Avenue roadway intersections, respectively, to estimate total CO concentrations at these locations. Worst-case artificial receptor locations were placed to determine the highest CO concentrations in the vicinity of the parking facilities and roadway intersections. At each receptor location, airborne CO concentrations attributable to the BART station parking facilities and to the adjacent roadway intersection were estimated independently and summed to produce a total airborne CO concentration. Airborne CO concentrations attributable to the BART parking facilities were estimated using the EPA-approved ISCST2 air quality model, using actual meteorological data obtained

Table D-1
Background Carbon Monoxide Concentrations

Year	1989 Measured CO Concentration (ppm) 1-Hour Average	1989 Measured CO Concentration (ppm) 8-Hour Average	Rollback Factor	Calculated Background CO Concentration (ppm) 1-Hour Average	Calculated Background CO Concentration (ppm) 8-Hour Average
1993	13.0	5.3	0.80	10.4	4.2
1998	13.0	5.3	0.66	8.6	3.5
2000	13.0	5.3	0.61	7.9	3.2
2010	13.0	5.3	0.51	6.6	2.7

Source: BAAQMD, 1993 (rollback factors); CARB, 1989 (1989 CO measurement).

from the SFIA; vehicular emission factors derived with the EMFAC7F emissions model; and traffic data specific to the BART alternative, analysis year, and peak traffic hour. Airborne CO concentrations attributable to vehicular emissions from the adjacent roadway intersections were estimated using the CAL3QHC dispersion model, as described above.

Cumulative Impacts

Cumulative CO concentrations were calculated to determine if the project would eliminate or reduce the number and severity of violations of the federal CO standards (see the conformity assessment discussion below). Traffic data for the Aerial Design Option LPA represent the sum of existing traffic, background traffic growth, traffic attributable to approved and funded projects (i.e. those projects specifically incorporated into the No Build Alternative), traffic attributable to projects built under the TSM Alternative, and traffic specifically attributable to the Aerial Design Option LPA. Thus, the model-predicted CO concentration represents the sum of the incremental contributions from all traffic sources. For a given intersection, alternative, analysis year, and peak hour, the 1-hour average cumulative CO concentration was calculated by adding the 1-hour average concentration at the worst-case receptor (i.e., the highest model-predicted concentration) to the 1-hour background CO value specific to the analysis year:

$$C_{C,\,1\text{-hr}} = C_{1\text{-hr}} + B_{1\text{-hr}}$$

where:

$C_{C,\,1\text{-hr}}$ = Worst-case cumulative 1-hour concentration (ppm);

$C_{1\text{-hr}}$ = One-hour concentration at worst-case receptor (ppm); and

$B_{1\text{-hr}}$ = One-hour background concentration for given year (ppm).

Eight-hour average cumulative CO concentrations were derived from the 1-hour results, using a persistence factor approach recommended by the EPA (1992). The persistence factor represents the relationship between 1-hour and 8-hour average concentrations at a specific location, considering local meteorological and background conditions. For a given intersection, alternative, analysis year, and peak hour, the 8-hour average cumulative CO concentration was calculated from:

$$C_{C,\,8\text{-hr}} = C_{1\text{-hr}} \times PF + B_{8\text{-hr}}$$

where:

$C_{C,\,8\text{-hr}}$	= Worst-case cumulative 8-hour concentration (ppm);
$C_{1\text{-hr}}$	= One-hour concentration at worst case receptor (ppm);
PF	= Persistence factor (unitless); and
$B_{8\text{-hr}}$	= Eight-hour background concentration for given year (ppm).

One-hour and 8-hour average cumulative CO concentrations were calculated for the Aerial Design Option LPA, TSM Alternative, and No Build Alternative.

Project-Specific Impacts

Project-specific or "net" CO concentrations were calculated to determine if the Aerial Design Option LPA alone would cause any exceedances of state or federal ambient CO standards and to determine BART's mitigation requirements, if any. The net CO concentration was determined by subtracting the portion of the model-predicted CO concentration that is attributable to non-BART traffic.

As noted above, the model-predicted CO concentration represents the sum of the incremental contributions from all traffic sources. For a given intersection, analysis year, and peak hour, the net 1-hour average CO concentration was calculated as the predicted 1-hour concentration at the worst-case receptor less the predicted 1-hour concentration under the TSM Alternative at the same receptor location, plus the 1-hour background CO concentration specific to the analysis year:

$$C_{N,\,1\text{-hr}} = (C_{1\text{-hr}} - C_{TSM,\,1\text{-hr}}) + B_{1\text{-hr}}$$

where:

$C_{N,\,1\text{-hr}}$	= Worst-case net 1-hour concentration (ppm);
$C_{1\text{-hr}}$	= One-hour concentration at worst-case receptor (ppm);
$C_{TSM,\,1\text{-hr}}$	= One-hour concentration under the TSM Alternative at same receptor (ppm); and
$B_{1\text{-hr}}$	= One-hour background concentration for given year (ppm).

Eight-hour average net CO concentrations were derived from the 1-hour results using the persistence factor. For a given intersection, analysis year, and peak hour, the 8-hour average net CO concentration was calculated from:

$$C_{N,\,8\text{-hr}} = (C_{1\text{-hr}} - C_{TSM,\,1\text{-hr}}) \times PF + B_{8\text{-hr}}$$

where:

$C_{N, 8\text{-hr}}$	= Worst-case net 8-hour concentration (ppm);
$C_{1\text{-hr}}$	= One-hour concentration at worst-case receptor (ppm);
$C_{TSM, 1\text{-hr}}$	= One-hour concentration under the TSM Alternative at same receptor (ppm);
PF	= Persistence factor (unitless); and
$B_{8\text{-hr}}$	= Eight-hour background concentration for given year (ppm).

One-hour and 8-hour average net CO concentrations were calculated for the Aerial Design Option LPA only; the net calculation is not applicable to the TSM and No Build Alternatives.

Conformity Analysis

In order to demonstrate conformity with the *1982 Bay Area Air Quality Plan* and the 1990 Clean Air Act amendments, as required by MTC Resolution No. 2270, a project must: 1) come from a transportation plan and program (i.e., a TIP or RTP) that has been found to conform; and 2) eliminate or reduce the severity and number of localized violations of the federal ambient air quality standards in the area substantially affected by the project.

The Aerial Design Option LPA meets the first conformity criterion if 1) the Aerial Design Option LPA is included in the current RTP and TIP, and 2) the current RTP and TIP have been found to conform to the SIP.

To determine if the Aerial Design Option LPA meets the second conformity criterion, the cumulative CO concentrations near roadway intersections predicted under the Aerial Design Option LPA and the No Build Alternative in the 1998, 2000, and 2010 analysis years are compared with the federal CO ambient air quality standards. (Although 1993 base year analysis is required under CEQA, conformity analysis considers only those analysis years in which the project will be in operation.) If there are no new exceedances of the federal CO standards under the Aerial Design Option LPA, then the project satisfies this criterion. This policy position is provided in the preamble to the final EPA conformity rule (58 CFR 62212) (EPA, 1993).

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